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A Sane Word.

BY R. W. RAYMOND.

Dr. H. S. Drinker, the president of Lehigh University, closed his address, June 27, to the graduating class of the South Bethlehem, Penn., High School, with an admirable and wholesome protest against the sentimental and ignorant pessimism of the day, from which we quote the following passage:

"You will not find it such a bad world. I am not in sympathy with the sentiment that has to some extent found expression during the past year or so—that our country is passing through a period of deterioration in morals and rectitude. What possible excuse is there for such a sentence as this, which I read a day or two ago in an address to his graduating class by a leading college president of our country: 'What is the blight and malady of our time? Is it not the mean and sordid conception of human life which everywhere prevails?' * * * And again: 'We are dealing with the virus of a universal infection. The whole nation needs a new baptism of the old virtue of honesty.'

"If college presidents holding morbid sentiments of this nature would theorize less in seclusion, and come out more into God's country and mix with their fellowmen, they would not talk such nonsense. It is so easy to tilt forensically and indiscriminately against the fabled monsters of our imagination, and so hard instead to apply ourselves to the prosaic task of recognizing and fostering the good that is about us! I believe with Chancellor Day, of Syracuse University, that a mawkish sentimentality has largely clouded the issue, and that there is no good foundation for the spirit of decrying our fellow-citizens as a body, and of classing them as less worthy than their would-be critics. The conscience of the nation, as a nation, is keen, and its instincts are for the right. There has been no period of moral stagnation through which our people, as a people, have been passing, and from which they are now awaking. What has occurred, and is occurring, is that our glorious nation is constantly advancing. * * * * * * The fact is that our ideals are continually becoming higher, and the struggle is to bring our past practice up to our ideals of the present, and to conform in our social and business life to the enlightened and clarified public opinion of the day. You girls and boys will find this world made up, as it ever has been, of all sorts and conditions of men; but you will find in our land far more good than evil; more charity than envy; more honesty than dishonesty; more honor than want of honor; and if you are true to yourselves and to those principles of right which are deep in the heart of our people and which have made us the great nation we are, you will find that honest dealing and steady industry will bring their reward.

"This world is a good old world in its way. It is growing better, decade by decade, century by century; but it is ever growing larger; and as it grows, business conditions change, our viewpoints change; and, while the relative amount of evil to good is less, the sum of what may be classed as evil may well be greater than it was in a smaller world of fifty years ago. But the evil is not predominant; and the right is the right still, thank God!—and is so recognized by our people."

For such a calm, sane deliverance we may well be grateful. Presidents, professors, philanthropists, patriots, politicians and pamphleteers many are tackling social problems now-a-days, without the necessary qualifications for inquiry and judgment. These qualifications include: human sympathy; knowledge of the principles of human justice as embodied in law; acquaintance with facts of actual social and business conditions; honesty in the statement of them; a sense of perspective as to their relative importance; the ability to distinguish between evils that are curing themselves, and those which need drastic, arbitrary remedies; and above all, the power and disposition to maintain moral principles, instead of destroying the basis of all morality by confounding violations of statutes with wicked crimes. A man like President Drinker, who possesses all these qualifications, is a boon to the community.

No better illustration could be given of the chaos of vociferous virtue into which we have been plunged by reformers, sincere and insincere, than the prevalent fury of condemnation visited upon the iniquity of "rebates." Rebates were not only once universal and universally approved; they constituted the method by which new railroads were made self-supporting, new towns and industries were built up, and the whole New West was conquered for civilization. They are still universal and unrebuked in all industries, except that of the public carrier. In fact, if the merchants in a given line get together, publish a schedule of prices, and agree to give no rebate thereon to anybody, we punish them for destroying competition! Now, it may be the case that the giving or taking of rebates in railroad rates has at last been wisely forbidden by statute, as injurious to the general welfare. Undoubtedly, it is the duty of all citizens to obey the law, whether it be wise or unwise. But it does not follow that those who committed the offense before it was thus made an offense ought to be hounded and stigmatized for having done so.

Again, some incompetent legislature passes a law, on this or on a cognate subject, the meaning, effect, and constitutionality of which nobody, from the executive down, can positively declare. After quarreling over these points until the weather peremptorily requires a pause, they compromise on a form not quite acceptable to anybody. It is the duty of good citizens to perform for that statute the work which its creators were too ignorant or too lazy or too cowardly to perform—namely, fix its meaning by submitting it to judicial scrutiny, construction and criticism. Yet any corporation which undertakes that duty will be denounced as defying the will of the people; and any judge who fearlessly applies to the muddled statute the principles either of English grammar or the American constitution may expect to hear thunder at the White House echoed from the pulpits, sanctums and pedagogical chairs.

Midsummer will pass away. Let us hope that madness will pass with it, and that, in the cooler atmosphere of autumn, we shall be able to discern once more the difference between such things as rebate and murder.

Cut nails, which are now commonly made of steel, are frequently found rusted in the keg, an occurrence which never used to be noticed when cut nails were commonly made of wrought iron.

Arizona and Sonora—VII.

BY DWIGHT E. WOODBRIDGE.*

THE CLIFTON-MORENCI-METCALF DISTRICT.

The Morenci-Metcalf copper camp is especially notable by reason of its great activity, from the low-grade ores treated, and from the power plants and concentrating mills. It is also interesting, just now, from experiments that are under way in the Detroit Copper Company's works with reverberatory practice on flue-dust and furnace-slag.

The tenor of the ores of the district runs about 3.5 per cent. of copper, and $5 in gold to the bullion ton (a mere trace in the ores as mined). Concentration is done upon 90 to 95 per cent. of the ores mined; it varies from five to seven and one-half tons into one. Labor in the camp is Mexican to a much greater extent than in any other district of Arizona, and it is non-union.

There are three towns in the district, namely: Clifton, where are the smelter, leaching works and some of the concentrators of the Arizona Copper Company, and both the smelter and the mill of the Shannon company; Morenci, where are mines, concentrator and smelting works of the Detroit Copper Company, and mines and some concentrators of the Arizona company; and Metcalf, where are mines of the Shannon and Arizona companies. These three towns together number some 15,000 persons, dependent entirely upon these mining industries. Clifton is reached by the Arizona & New Mexico railway, the property of the Arizona Copper Company; Morenci, by the Morenci Southern road, belonging to the Detroit company; and Metcalf by a narrow-gage branch of the Arizona & New Mexico, known as the Coronado railroad.

The Morenci Southern is probably the most circuitous railway in the world; its track, upon leaving the upper terminal, makes four complete loops in a mile, and five before it reaches the San Francisco river. Its grade is 3.5 per cent., and its sharpest curves are 40 deg. Both this company and the Arizona have extensive systems of narrow-gage roads about Morenci, including many tunnels and an 800-ft. incline connecting with the Coronado road.

Morenci is unique in the fact that topographical conditions have prevented the construction of wagon roads; with the exception of the little plaza before the hotel and store, there is no place for a wheeled vehicle. The ever present burro and the mule, with panniers, constitute the only means of reaching the dwellings of this town of 6000 people. All water for the town, and for its smelter and concentrators, is lifted by pumps from a great distance; much water comes from the San Francisco river, 1500 ft. lower down.

Morenci is one of the many Arizona towns that used to have a bad reputation. Morenci certainly had its characteristic gentry in plenty; for the town was formerly a howling mixture of bad men, gambling dives, bad whisky and dance-houses and the life of the tenderfoot was not enjoyable.

The town was located immediately below what is now the Detroit Copper Company's clubhouse; it consisted of 'dobe huts, "tin-can" and shack houses, dry-goods boxes, etc., in wild and tortuous confusion. But Morenci was purified "as by fire."

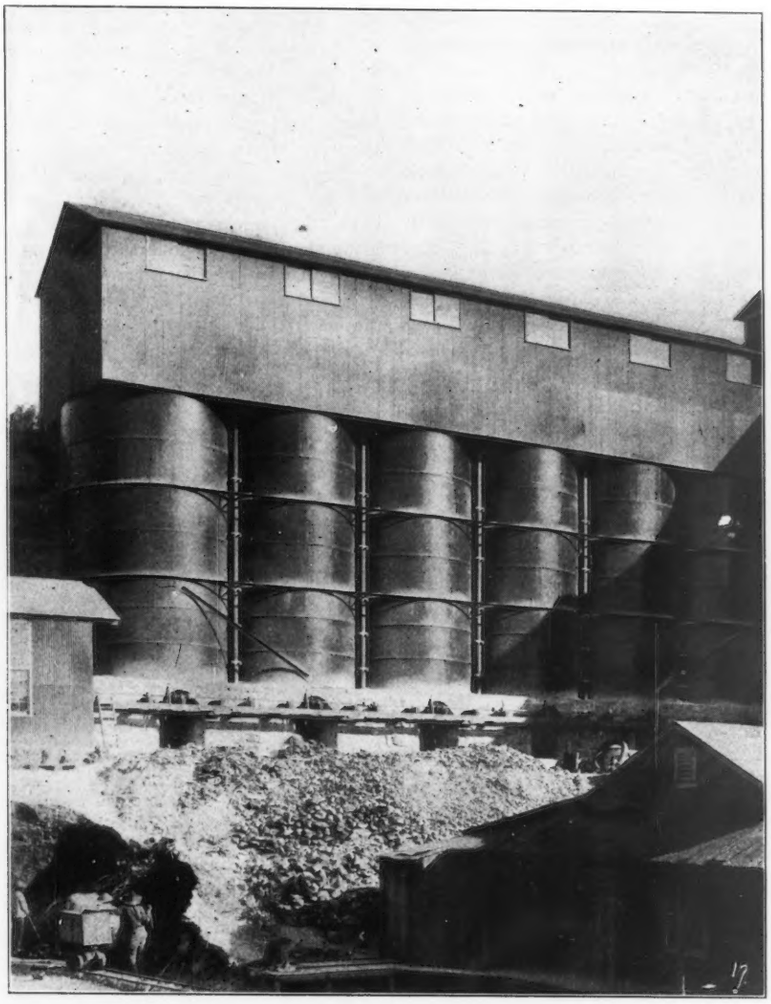
Soon after Phelps, Dodge & Co. took possession, fire broke out, and in a few hours the tough characters were out of business; the ground belonged to the company. The ashes were hardly cool before Superintendent Mills posted notices of eviction; the next morning men were grading the old site for company purposes. A new town arose. All gambling dens and evil resorts have vanished to Newtown, over the hill; and Morenci itself is clean.

Phelps, Dodge & Co. has built a beauti-

DETROIT MINES AND MILL.

*Mining engineer, Duluth, Minn.

ful, club-like hotel, one of the best in the Southwest. The company has also built a large club-house and library for its men; it has established an excellent store, where goods of every description are sold at reasonable profit. Liquor is sold in the town only at this store and at that of the Arizona Copper Company and under careful regulations at each. School buildings have been built at the joint expense of the two companies; and there are fine and well managed hospitals.



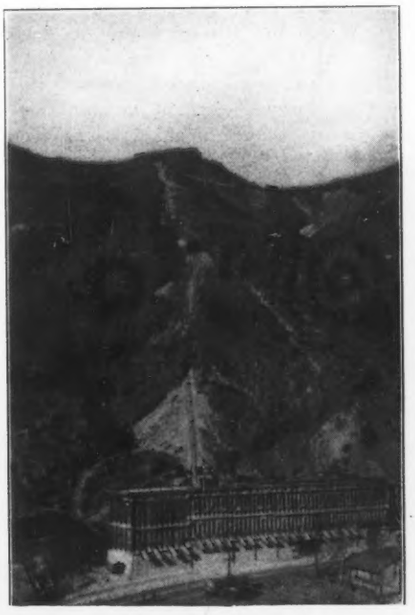
250-TON STORAGE TANKS. DETROIT COPPER COMPANY, MORENCI, ARIZ.

For many years this so-called "Clifton copper district" of Arizona led all others in the Territory in production of metal; but it has now fallen far behind Bisbee, on account of the tremendous developments in the latter region during the last two or three years. The production of Clifton smelters for the present year will probably approximate 45,000,000 lb.; while the works at the neighboring village of Morenci will make fully 20,000,000 lb. additional. Three years ago the Clifton companies produced 36,800,000 lb., and the Morenci works 16,558,000 lb. of copper.

The ores mined throughout the district average about 3.5 per cent. of copper, though the Shannon (which is now running its own smelting plant) has an average slightly above this. Four years ago the Shannon was mining oxidized ores exclusively, and its average was about 8 per cent.; today it is 5 per cent. copper. Much ore produced from the workings of the Arizona Copper Company averages less than 3 per cent. which is the leanest grade in the district, and the lowest in tenor of any copper mined in Arizona. Mining is chiefly in the great low-grade deposits under Copper King mountain, at Morenci; at Longfellow, adjoining; and at Shannon mountain, three or four miles to the north. There is no mining near Clifton, to which point the ores and concentrates of the Arizona and Shannon companies are transported on narrow-gage tracks. Mining-costs in the district average a trifle more than $2 per ton.

The district is the oldest in Arizona: it was first opened in 1872, a discovery of gold quartz having been made near Morenci in 1870. The story goes that the first prospectors were driven into these desolate box-cañons and barren mountains by Apaches, who were ravaging the regions to the south. If this is true, the Apache warriors did better than they knew, for the wealth that has been taken from the district since then has amounted to more than $80,000,000. These first prospectors were Messrs. Yankie, Bullard and Swishelm, names familiar to Arizona.

For many years the development of the region was slow, on account of the lack of proper railway facilities; but it was materially aided by the construction of the Southern Pacific across Arizona, and by the building of the Arizona & New Mexico from the trunk road to Clifton, in 1884. The Longfellow mine, at Morenci, was the first copper development in all Arizona; it was sold by its discoverers to the Lezinski Bros., (then of Silver City, New Mex., now of New York) in its first year. At that time the nearest railway point was La-Junta, Colo., 700 miles away; the intervening space was covered by bull-team or on foot.



LONGFELLOW INCLINE, ARIZONA COPPER COMPANY.

Many a man still living in the cañons around these towns can tell hair-raising stories of the early days and the hardships of the long journey across the deserts and over mountains infested by "hostiles." In 1882 Geronimo made his last famous raid against the settlements, and the inhabitants of Longfellow were attacked. Indian depredations continued till 1885, and the murders of defenseless whites and lone prospectors were frequent. But Longfellow ore was oxidized and easy to smelt; the Lezinski Bros. built an adobe smelter with a blacksmith's bellows for air, and succeeded in making copper bullion, which was hauled across country to LaJunta, on the Santa Fe road.

From Clifton to Metcalf, the way lies up the narrow and tortuous cañon of Chase creek; the Coronado road (36-in. gage) connects the two, and taps the mines of Morenci by means of a long steel incline down Modoc mountain. In 1879 Lezinski Bros. built a 20-in. road up the creek, hauling their engine and cars overland from LaJunta. The original locomotive is still to be seen; it is a 4-ton Porter, 20-in. gage, 6x10 in. cylinders; it was the first locomotive in Arizona. At Clifton the Lezinski Bros. built a small water-jacket furnace for smelting black copper, on designs that had been introduced by the Messrs. Williams at Bisbee. The mine then produced 20-per cent. ore and some 40 tons per day were smelted. This was the base from which has sprung the large and important works of the Arizona Copper Company.

The present company bought the properties in 1882; two years later the smelting works were enlarged to a capacity of 240 tons per day. Up to 1891 the company relied almost entirely upon the rich, self-fluxing ores found on the lime contact of the Longfellow and Detroit mines; but these were evidently becoming exhausted. Conditions were discouraging. The company had been in operation nine years; there had not only been no dividends, but the good ores seemed to be used up. Low-grade ores, of which the camp was abundantly supplied, could not to be treated, but study and technical skill relieved the situation. In 1894 the company erected its leaching plant, which is still in operation. Later, concentration was adopted; the record since then has been one continued succession of net earnings and good dividends.

The Detroit Copper Company opened mines on Copper mountain in 1880. Mr. Church was the discoverer and he interested Capt. Eber Ward, of Detroit. About 1884 a smelter was built, first on the 'Frisco river, and then at the mines. All supplies were hauled up the 20-in. road, lifted over the Modoc incline, then hauled again over another crest, and so down into Morenci. The low-grades produced at these mines wrought at that time a most important change in the metallurgical history of Arizona, for concentration was decided upon and a mill was built. It was the first in the Southwest, and was immediately followed by a similar mill for the Arizona Copper Company at Clifton.

The Detroit company was bought in 1897 by Phelps, Dodge & Co., New York, which had been more or less interested for some years; the entire capital stock is now held by it. The company will average this year a production of about 1,750,000 lb. of copper per month.

The Shannon Copper Company began business in 1900, and is now making cop per at the rate of about 1,000,000 lb. per month, out of its own concentrator and smelting plant.

SHANNON INCLINE.

These three companies are the only ones operating in the district so far on any considerable scale, though there is some talk of new and strong interests from the north and west, and a number of claims on both Copper and Shannon mountains are said to have been recently placed under option.

The annual report of the directors of the Stolberg & Westphalia Company for 1905 shows that in that year its mines produced 7967 tons of lead ore, 16,965 tons of blende, and 751 tons of calamine, altogether 25,683 tons of ore, as against 26,122 tons in 1904. The number of miners employed was 2226, against 2116 in 1904. The smelting works of the company afforded employment to 1584 men.

In an engine house where a drum is operated, if little noise is desired, it is possible to employ raw-hide teeth upon one wheel, if the pressure be inconsiderable.

The Earthquake as a Road-builder.

SPECIAL CORRESPONDENCE.

The Ocean Shore road is a line which is being built between San Francisco and Santa Cruz, and is to run close to the ocean the entire distance. J. B. Rogers, the chief engineer, says that this new coast line, while damaged to some extent, was actually benefitted in one place by the earthquake to the extent of about $15,000. Along the strip of coast country known as Mussel Rock bluffs, the Ocean Shore road was progressing nicely with the work of grading its roadbed, when the earthquake came along and accomplished in a few seconds what the company would have taken weeks and the expenditure of many thousands of dollars to accomplish. The bluffs in question were very precipitous, and in order to secure a roadbed for the electric line half-way up the bluffs it became necessary to remove thousands of yards of overhanging rock and earth. This was to be accomplished by boring from above and putting in heavy charges of blasting powder. The earthquake shook down an immense amount of material, and did the work much better than it could have been done by blasting. Where a precipitous bluff stood before the earthquake is now a sloping hill that can be graded at comparatively little expense. This offsets probably half the damage which the road sustained in other places.

The general plan of power-house work of three years ago was not radically changed until the advent of the steam turbine. Engine-driven plants at that time differed from one another practically only in constructional details and in the sizes of units and auxiliaries. This was the evolution of about 20 years and the power space development at that time had reached the point where, as it was often said, one bought a power house by the yard.

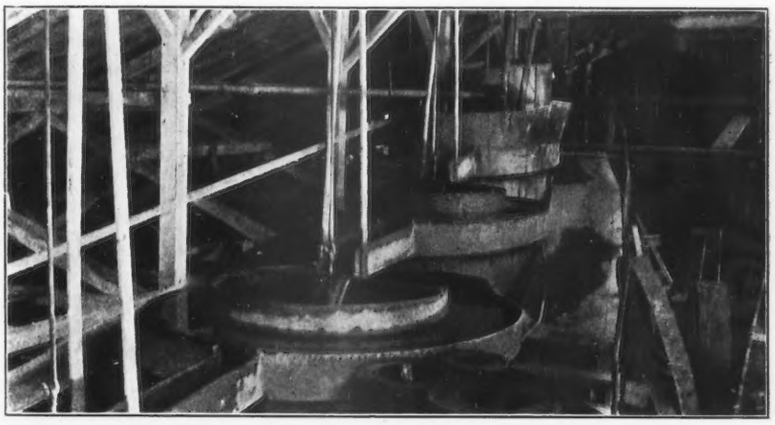
The Daly-West Mill, Park City, Utah.

STAFF CORRESPONDENCE.

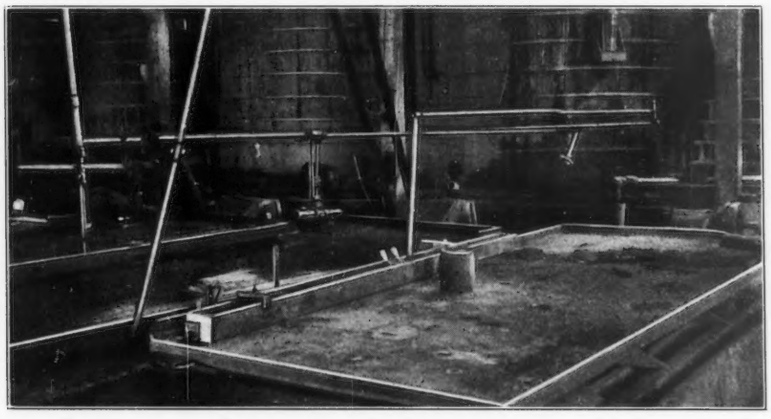
The Daly-West mill is particularly interesting because it is here that F. W. Sherman developed his system of milling, one feature of which is the small amount of water used. Another principle is never to reject tailings until they have been re-treated at least once. Jigs are good coarse concentrators, but he does not reject tailings from jigs. Mr. Sherman has also invented a system of classifying tanks with which he effects a close classification of pulp and treats each size on a separate table or slimer. The middlings from the tables are re-concentrated on other tables or else sent back to the classifying system, because middlings from the tables of this mill—treating classified pulp—are due not so much to attached fragments of lighter minerals as to the fact that the small grains of the heavier minerals wash under the coarser particles of the lighter, producing a middling band which can be separated by re-treatment, without intermediate crushing.

The mill discharges no more water than is absolutely necessary to wash away tailings. It treats 400 tons of ore a day and discharges only 40 gal. of water per minute with tailings, although about 350 gal. per minute are flowing through the system. The overflow water from the classifiers is used as wash water on the tables, for jig water, and also in re-grinding the dewatered jig tailings. By this method Mr. Sherman effects a saving of over 95 per cent. Pb (by wet assay), 75-80 per cent. Ag. and about 50 per cent. Zn upon an ore which averages 4.5 per cent. Pb, 11.3 oz. Ag, and 5.2 per cent. Zn. Much of the lost silver goes off in the zinc blende and in the silver chloride which occurs in the upper levels. To make a high saving of zinc is not attempted at present, but another mill for saving the zinc values is already planned and its erection is contemplated as soon as the Ontario drain tunnel is re-opened.

The mill contains a number of novel devices, of Mr. Sherman's invention, which appear to be quite good. The springs that hold the rolls up to their work are kept under tension by a nut screwed up tightly against a series of nine rubber disks 1 in. thick, separated by sheet-iron plates. These are compressed so that the rolls are rigid while crushing ore, but if a piece of iron gets between them they will open about 1½ or 2 inches.



SHERMAN CLASSIFIERS.



SHERMAN CLASSIFIERS, FEEDING TABLES.

The old type of Huntington mill has been improved mechanically and by the addition of new principles. The stem to the muller rotates in an oil bath entirely protected from grit and dirt. These stems now extend above the yokes and are connected with turnbuckles and tension springs whereby the mullers are held lightly against the die ring. No attempt is made to increase the capacity, but only to cause the mullers to work smoothly against the ring, for then they wear round instead of rough as they do in the old style Huntington mill. Then too, in case of any temporary overload, the tension in the rods prevents choking.

The Sherman classifier is an outside cylindrical tank with a conical bottom, inside of which is a steel cylinder whose section area is just half that of the annular space. The inside cylinder is supported from above with its rim 6 in. higher than the outside cylinder. The inside cylinder does not extend down to the bottom of the outside one. The pulp is admitted to the center cylinder and passes down through a screen (put there to keep out sticks, etc.), then up through the annular space and overflows to a circular launder around the outside of the outer cylinder. This discharges to a similar tank which has twice the area of the tank preceding it.

The Sherman table is an improvement on the old Hooper slimer. It consists of 24 trays, each 1 ft. wide by 5 ft. long, attached side by side to form an endless belt which travels over sprocket wheels at each end. The first four of the trays are given a bump and jar which tends to throw the material toward the head of the tray and also has the effect of stratifying the material as in an old Cornish dolly tub. The surface of the belt is twisted, the head ends of the first trays being the most elevated, the end of the last tray the most depressed, while the middle tray is level. The other seven trays of the top deck are given a vanning motion which washes off the top of the bed, stratified by the jarring motion of the first four trays. The device which gives the reciprocating motion operates in an oil bath and is placed above the table out of the way of any splash. The trays have a piece of linoleum at their head ends, where the feed pulp comes on, but the bed of the trays is lined with canvas.

There are two troughs under the discharge ends of the trays, one for the middlings and the other for the tails. Middlings come off the first two trays before stratification has been effected, and also off the last few trays when the top layers of the bed are being washed off. The point where to cut out the middlings is determined by panning the tailings coming off the different trays. The

heads are washed off the trays by a jet of water coming from a perforated pipe placed under the end of the table.

The method of keeping assay results at the Daly-West mill, is unusual. Fire assays are made from daily samples of the ore. A proportion of each daily sample is kept for making up a weekly sample which is assayed by the wet method.

This sample is made up by weighing out from each daily sample the proportion represented by that day in the weekly run. The weekly samples are saved and combined in a similar way to make a monthly sample which is also assayed by the wet method. These monthly samples are then combined into a yearly sample.

The concentrates made at the Daly-West mill average about 30 per cent. Pb, 15 per cent. Zn, 6 to 7 per cent. Fe, 50 oz. Ag. and 14 per cent. SiO_2.

The concentration is about 7 into 1. The tails carry 2 to 3 oz. Ag, 0.3 per cent. Pb (wet assay), and 2 per cent. Zn.

It takes about 300-h.p. to run the three mills. A 175-h.p. Ideal engine runs a dynamo which furnishes current to the motors driving the tailing mills. A 500-h.p. Corliss engine is being installed to take the place of the three small engines now used. This horse-power provides for future increases.

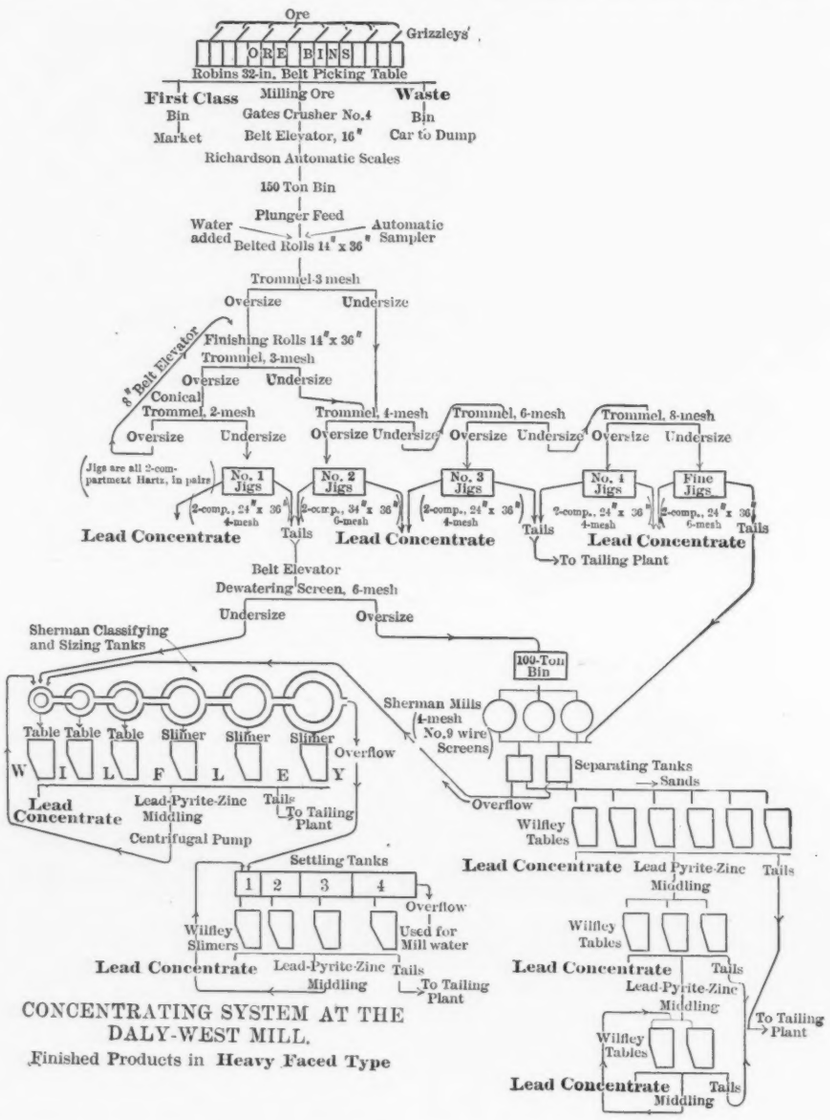
All concentrates are loaded into cars and hoisted to the landing floor of the shaft, down which they are lowered to the 1200-ft. level and thence pass out through the upper Ontario tunnel just above town.

THE MILLING SYSTEM.

Ore is run in the cars from the shaft to a large bin holding 1800 tons. This bin is divided into sixteen compartments and a series of eight grizzlies, with 1½-in. openings, is placed one in the center of each track, over which the ore is dumped. The undersize from each grizzly falls through into one compartment while the oversize goes off the end into another. Thus there is a series of bins holding alternating coarse and fine ore. Each compartment has a door, operated by a rack and pinion, and the ore is fed to a 32-in. Robins picking belt by plunger feeders. The chutes from the coarse bins are longer than those from the fine bins so that the coarse ore is thrown to the far side of the belt where it is handy for ore pickers. The waste and first-class ore is picked off this belt, the waste going to one set of small bins and the first-class to another.

The ore from the picking belt goes to No. 4 Gates crusher and is then elevated to a Richardson automatic scales where it is weighed in lots of 1000 lb. From the scales the ore falls to a 150-ton bin whence it is fed by a plunger feed to a set of belted rolls (14x36 in.) where water is added. A sample is automatically cut out from the whole stream of ore every 15 minutes. From the rolls the ore goes to a trommel of 3-mesh wire cloth. Oversize goes to finishing rolls (14x36 in.), and then to a second 3-mesh trommel. The oversize from this goes to a 2-mesh conical trommel, oversize from which is elevated to the fine rolls and again goes through the circuit. The undersize from the 2-mesh goes to the No. 1 jigs, while the undersize from the first two 3-mesh screens passes through a series of three trommels having respectively 4-mesh, 6-mesh and 8-mesh screens. The oversize from each trommel goes to a pair of 2-compartment jigs, No. 2, No. 3, and No. 4 jigs, while the undersize of the 8-mesh goes to a pair of 2-compartment fine jigs. On all of these jigs a lead product is made. The No. 1 and No. 2 jigs have side discharge, while the No. 3 and No. 4 and the fine jigs discharge most of their concentrates through the hutch.

The tails from all these jigs are re-treated; those from No. 3 and No. 4 go direct to the tailing plant, but those from the fine jigs join the tails from No. 1 and No. 2 jigs, after the latter have been re-crushed in Sherman mills, and both go to the two settling tanks. The tailings from No. 1 and No. 2 jigs are discharged to a cup elevator and are lifted to a de-watering trommel having a 6-mesh screen. The de-watered sands fall into a 100-ton bin whence they are fed to three Sherman centrifugal mills; here they are ground to pass a 4-mesh screen made of No. 9 steel wire. The water from the 6-mesh de-watering screen goes to the first of a series of six Sherman classifying tanks.



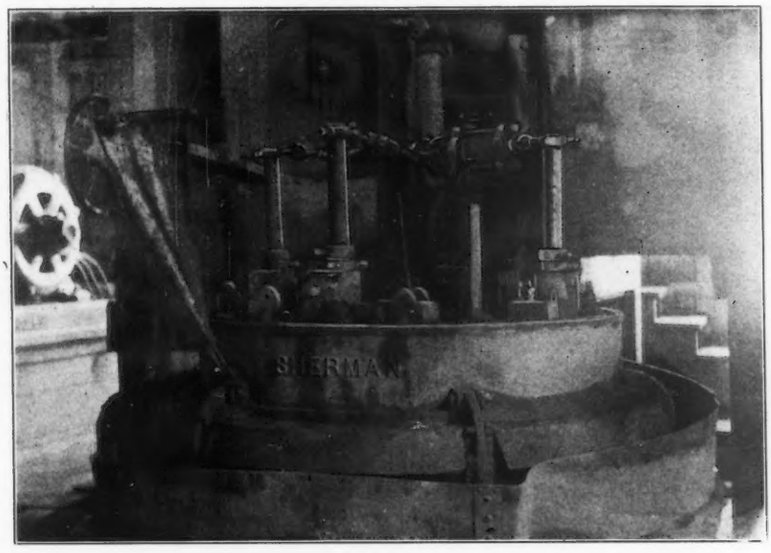
CONCENTRATING SYSTEM AT THE DALY-WEST MILL.

Finished Products in **Heavy Faced Type**

The pulp from the Sherman mills, joined by the tails from the fine jigs, goes to two Sherman settling tanks which feed six Wilfley tables. On these tables a lead concentrate, a lead-pyrite-zinc middlings and tails are made. The lead-pyrite-zinc middling is re-treated upon three other Wilfleys, which make a lead product, a zinc-lead-pyrite middling and tails. The middlings from these three tables are re-treated lastly upon two more Wilfley tables which give as

before a lead head, zinc-pyrite middling and tails. The middlings are pumped back to be re-treated on themselves.

The overflow from the two Sherman settling tanks, together with undersize from the de-watering screen, goes to the first of a series of six Sherman classifying tanks. Each of the first three of these tanks feeds a Wilfley table, while each of the last three feeds a Wilfley slimer.



SHERMAN MILL.

These tables and slimers produce a lead head, a zinc-lead-pyrite middling and tails. The tails go by launder to the tailing mill while the middling product is returned by a centrifugal pump to the classifying tanks.

The overflow from the last of the classifying tanks goes to a 4-compartment rectangular settling tank, the compartments of which feed four Wilfley slimers which produce a lead head, lead-pyrite-zinc middling and tails. The tails go to the tailing mill, while the middlings are returned to the 4-compartment settling tank. The overflow is used for wash water throughout the mill.

THE TAILING MILLS.

Tails from the tables are first run over an 8-mesh trommel; all the oversize is rejected and sent to the dump as it contains no values. The undersize of the 8-mesh goes directly to a settling tank. Tails from the jigs come to this same settling tank; the overflow goes to the first of a series of six Sherman classifying tanks while the sands discharge into a bucket elevator which lifts them to a 8-mesh de-watering trommel, the undersize from which goes to a 2-compartment Harz jig having 24x36-in. screens of 8-mesh wire cloth. The tailings from this jig are rejected.

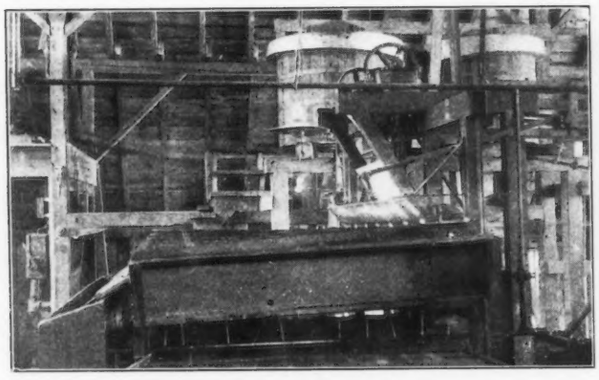
The oversize from the de-watering screen goes to a 50-ton bin whence it is fed to a 5-ft. Sherman centrifugal mill which has a 4-mesh, No. 9 steel wire screen. The pulp from the Sherman mill then goes to the first of six Sherman classifying tanks. Each of the first three of these tanks feeds an Overstrom table, each of the next two feeds a Wilfley slimer and the last one feeds a Sherman slimer. The overflow from the last tank of the series goes to a series of 19 Sherman settling tanks which are 6 ft. in diam. and 5 ft. deep. The settlings from these tanks go to a Wilfley slimer. It is the intention soon to send half of these settlings to another Sherman slimer in the third mill.

The middlings from these tables or slimers are all pumped back to the first of the six classifying tanks. The overflow water from the series of 19 tanks is pumped back to the first mill except that which is used on the Sherman mill and for wash water on the tables.

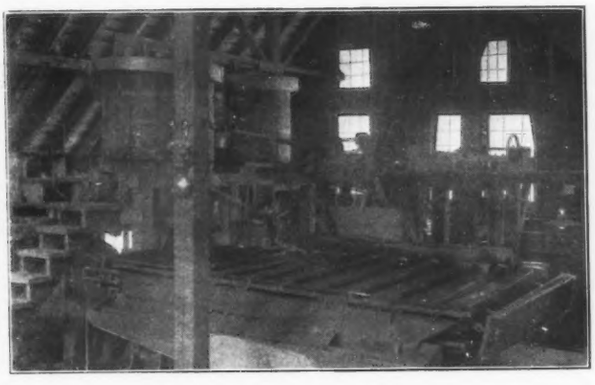
The tailings from the tables and slimers of the second mill go by launder to the third mill, where they enter a series of four settling tanks. The coarsest tailings are rejected but the fine tailings —mostly under 200-mesh—are elevated by a centrifugal pump to a distributing tank which delivers them to two Sherman tables (or slimers) which make a lead head, a middling and tails. The middling is sent back to the four tanks and is re-treated. The tailings go to a settling tank the overflow from which is pumped back to the first mill, while the settled tails are discharged to the dump with as little water as possible.

At present two more Sherman tables are being installed in this third mill, one to treat part of the settlings from the series of 19 tanks in the other mill, and the second to re-treat the middlings from the second mill which will be brought down by a separate launder instead of being pumped back to the series of six classifying tanks, as at present.

The second mill pays about $10,000 a month while the third mill at present is bringing in about $3,000 a month. Formerly these values were all lost. The company is now starting to treat in its tailing mills about 100,000 tons of tailings which were accumulated in a tailing dam before these mills were erected.



SHERMAN SLIMER FROM THE END.



SHERMAN SLIMER FROM THE FRONT.

American Amethysts.

From time to time amethysts are discovered in North Carolina, especially in the region of Rabun Gap, Georgia, on the North Carolina border. According to George F. Kunz, no quantity sufficient to warrant mining seems to exist, yet many of the stones are beautiful, second indeed to none found in foreign localities.

The Discovery of Tonopah.

STAFF CORRESPONDENCE.

The following is an accurate statement of the discovery of Tonopah. It is based upon information from James L. Butler, the original discoverer, from T. L. Oddie, one of Butler's original partners who attended to all the ore settlements during the leasing days and was manager of the Tonopah Mining Company for two years, and from W. J. Douglas. who, with his partners Stuart and Dunlap, shipped the first two carloads of ore from the camp. The dates given are on the authority of Butler himself.

The site of Tonopah was not unknown. Cattlemen had often ridden over the country. Prospectors had passed by it as they hurried south to a small camp called the Southern Klondike, which was once the scene of much excitement, and to other earlier camps. Indians camped at nearby springs and these Indians are said to have brought in specimens of ore to mining centers from this region; but, as the stuff did not "pan" free gold, and the people were not acquainted with the Comstock ores, which those from Tonopah resemble, it received no attention. The region had been surveyed and it was from one of the surveyors of this party that James L. Butler, the discoverer of Tonopah, got his first inkling of the richness of this region.

FREIGHT TEAM ON MAIN STREET, TONOPAH.

Jim Butler was no tenderfoot. Having been born in El Dorado county, Cal., in 1855, he had grown up surrounded by mines. Leaving California to join the rush to the Comstock, he spent his time following one boom after another in this Nevada land. From the Comstock he went to Austin, then to White Pine, Mineral Hill, and then Pioche. Thus he prospected all over the State. Happening to be at Reveille in 1881, be met a young man, one of the party that surveyed the region where Tonopah now stands, who told him of a very rich region to the west of Reveille. He showed him a small sample and an assay slip which gave $800 to the ton; no one at Reveille believed the story so nothing came of it, although it is almost certain that Tonopah was the place described.

In the spring of 1900 Butler started out to prospect the Palmetto and Silver Peak range. As there was an assayer at Southern Klondike he decided to go by way of that place. Following along the line of porphyry hills south of Belmont, on May 17, 1900, he discovered the Mizpah lode, taking the first samples from what is now the Buckboard claim. He took the samples to his friends, Higgs and Brougher, of Southern Klondike and waited three or four days for them to be assayed, then started back to Belmont determined to look over the ledges again. The sample left with his friends was thrown out of doors as worthless. On the way back, on May 26 and 27, he took some more samples of the ore and proceeded to Belmont, where he told T. L. Oddie, district attorney at Belmont, that if Oddie would have the ore assayed he would give him a share in the claims. Mr. Oddie sent the samples on to a friend of his, W. C. Gayhart, an assayer at Austin, Nevada, offering to give him a share in the claims if they were worth anything. The results of these assays, eight in number, went from $80 to $600 a ton.

Butler was very busy on his ranch and did not go immediately back to where he got the ore. In the meantime, the news of the high assays had traveled. Higgs and Brougher heard of them, hunted up their sample and assayed it with the result; Silver, 355 oz.; Gold, $152 per ton. They started out to find the veins, but, although they passed quite near, they failed to find them.

On June 14, Mr. Butler took some more samples, but it was not until the last of August that Butler and his wife returned to the veins and located them, eight in all—the ones which were subsequently sold to the Tonopah Mining Company. Mrs. Butler located the Mizpah claim and gave the camp its name—Tonopah. On October 8, Butler, Brougher and Oddie fitted out a wagon with supplies and started for Tonopah to complete the locations, and work the veins. Oddie and Brougher paid $25 down on this load of supplies and the three were trusted for the rest. This was all the money spent on these outcrop claims, for they paid from the grass roots down for all their development. They sunk a shaft 15 ft. deep. They loaded this ore into two wagons holding about a ton each and sent one wagon out to Eureka, the other to Belmont and then to Austin. It netted them $600, and with this they brought in men, supplies and provisions, and work began in earnest. The average of the first 15 assays on Tonopah ore was $171 a ton, while the average of the second 15 assays was $471 a ton.

OPEN CUT, LEASE 4, VALLEY VIEW VEIN, TONOPAH, NEV.
The first carload of ore came from this cut. Mt. Brougher in distance.

The owners immediately began to let leases on the different lodes. The first four of them were 200 ft. along the vein but later leases were only 100 ft. long. The leases were merely verbal agreements between the leaser and Jim Butler, and 25 per cent. royalty was paid. The leaser having chosen some unoccupied ground along the lode, put up stone monuments marking the boundaries of his lease. The first 18 leases were upon the Valley View and the Burro veins, but later also the Mizpah vein was leased. Each lease was numbered in the order that it was let, so that in case either the side lines of

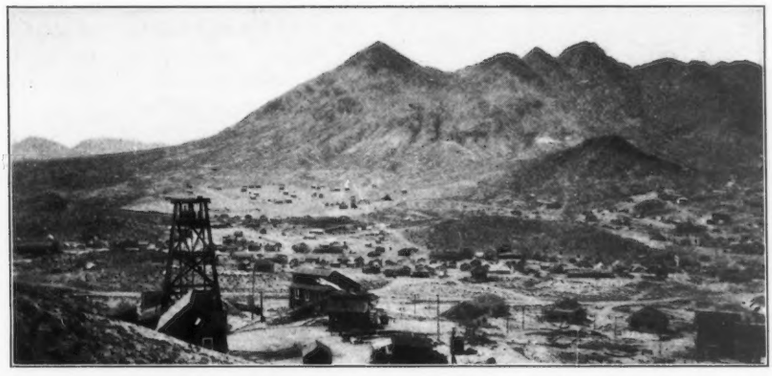
one lease passed in depth into another lease, or the veins united in depth, it would be easy to determine the prior lease.

At the same time the owners worked some of the ground themselves. Most of the leasers had very little to begin with but they were given credit at the store. Probably most of the tools came from among those supplied to men working on the owners' ground.

At first the freight on ore to Sodaville was $25 a ton, but later it became $15. All the ore from the first was shipped through Mr. Oddie, who attended to all the business. He took out the 25 per cent. royalty and then paid each leaser what was coming to him. The ore was shipped in sacks and on each was marked the number of the lease. The ore was hauled by wagon to Sodaville a distance of 60 miles and then shipped by narrow-gage to Moundhouse where it had to be transferred to broad-gage cars. The numbers sometimes got rubbed off the sacks, sometimes sacks of ore got misplaced in the transferring, and quite a little confusion arose but there were never any disputes.

The wages then prevalent in Nevada camps were $3.00 to $3.50 a day, but Mr. Butler raised the rate to $4 a day which has been the ruling rate ever since.

LEASER'S DUMPS ON MIZPAH HILL, TONOPAH, NEV.



DESERT QUEEN SHAFT, TONOPAH, NEV.

The leases held until Jan. 1, 1902, although Mr. Butler had sold the claims to the Tonopah Mining Company in June, 1901 for $336,000. The company tried to get Mr. Butler to terminate the leases at the time of purchase, but he stood by his oral agreement and refused to sell unless the leases were allowed to run until the end of the year, the time agreed upon.

There were about 120 different leases upon the lodes. Some of these were thrown up and then re-taken by different parties or sub-divided into smaller leases, and some leases were sold to other parties, so that there were at one time 218 different accounts with leasers. During this period $7,000,000 passed through T. L. Oddie's hands. There were no written agreements, and even the boundaries were only marked by piles of stones upon the ground, but there was never a single dispute over settlements, nor a quarrel over boundaries, although moving a boundary six inches meant the loss of thousands of dollars to one or the other leaser.

The first ore shipped came from the Valley View lease No. 4—the Stewart & Dunlap lease. In some of the leases, a depth of 200 ft. on the lode was reached. At first only open cut work was done but later regular underground mining. was resorted to. The windlass was used at first but toward the last steam or gasoline hoists were utilized on some of the leases. The ore shipped by the leasers averaged about $150 a ton. Some of the leasers had several men working for them.

The discovery of Tonopah was not the chance luck of a tenderfoot, but the culmination of many years spent by Mr. Butler in prospecting Nevada from one end to the other. Several persons who knew him long before he discovered Tonopah all agree that Butler was a born prospector possessing remarkable powers of observation.

The gold yield of Victoria for the last four months was 265,344 oz., of the value of £1,061,376, being an increase of 39,514 oz., valued at £158,056 as compared with the corresponding period of last year.

A New Sampling Plant at Tonopah.

The large reduction and sampling plant of the Tonopah Sampling and Ore Purchasing Company, is now nearing completion in the northern suburbs of Tonopah. The main building is of five stories with a two-story basement, 96x32 ft. and 76 ft. high, the basement extending to a depth of 20 ft. below grade. It is built in the type common to this class of buildings, and is covered with corrugated iron.

The building is provided with eight storage and two receiving bins, each with a capacity of 100 tons. These are connected with three bucket elevators used in conveying ore to the top story, whence it descends by gravity through the various operations and is distributed through chutes to proper receptacles, ready for the assayer. Every operation is performed automatically, precluding the possibility of error in the weight or measure of ores being treated. Eighty-five tons of ore will be treated daily when the plant is in regular operation.

The equipment consists of two Gates style "D" ore crushers; one set of rolls 40x15 in., one 30x10 in., and another 20x 10 in.; two pulp grinders; a 150 h-p. Allis-Chalmers motor; one double Vezin sampler; and one duplicate Vezin sampler; all of the Allis-Chalmers make.

A transformer house has been erected adjacent to the main building, in which three transformers are installed. The remaining buildings in the group are a four-room office, a building 18x24 ft. for sampling, and an assay office. The treatment of ores at the new plant will begin as soon as the railroad tracks leading from the main line to the works can be completed.

There have recently been serious troubles in the Yglesias mining district of Sardinia, this district being the most important producer of lead and zinc ore in that Island. Soldiers were sent to the district, and in the latter part of May the riots were partially restrained, but according to our latest advices the trouble has not yet been fully settled.

Lead Mining in the Wisconsin-Iowa-Illinois District.

STAFF CORRESPONDENCE.

Lead mining began very early in this region. Dubuque, Ia., Galena and Elizabeth, Ill., and the southwestern part of Wisconsin were the main centers of early lead activity, but it spread northward over all the territory where now the excitement of zinc mining prevails. Lead mining flourished until 1870 when, owing to the fall in price of the metal, it nearly ceased. Since then lead has been mined, but only on a small scale. A good deal of galena is now produced by the milling of jack ores, for generally there is some lead associated with the zinc. The lead ores were formerly smelted in small furnaces in the district, and there is still a small furnace, near Dodgeville, Wis., which is run intermittently.

"COG MINERAL," SKENE MINE, ELIZABETH, ILL.

Lead mining flourished especially in the southern part of the district, and it is noteworthy that the only places where lead mining is being continued are here, at the Raisbeck mine near Galena, and at the Skene mine near Elizabeth, Ill. This confinement of lead mining to the southern part of the district is due to the fact that the rising of the strata toward the north brings the underlying horizons to the surface, whereby the Galena limestone —the ore-bearing horizon—is delimited along a line parallel to and a few miles south of the Wisconsin river. At Galena and Elizabeth, the base of the Galena limestone is 175 to 225 ft. below surface.

At Elizabeth, Ill., lead mining is beginning to revive. Here the Skene mine is, and has been for the last four years or more, producing good lead ore. Recently several other companies have begun to sink below the water level on some of the old lead ranges. Elizabeth in former times produced large amounts of galena which was also smelted on the spot. All the ore came from crevices above water level, which is about 60 ft. below the surface. It is thought that the lead mines ought to be equally productive for some distance below water level, as has proved to be the case at the Skene. Besides there is the possibility that the lead will pass in depth into zinc, which, in this district, forms a more lasting deposit than the lead. Near the bottom of a core drill-hole put down 300 ft., near the Skene mine, some pieces of jack were found, and the same occurred at a depth of 250 ft. underneath the town.

So confident are these companies of their ultimate success that, instead of small prospecting shafts, they are sinking three- and four-compartment shafts, through which they hope to hoist the lead ore in cages. This over-confidence is not particularly blameworthy, because the cost of taking out a few additional square feet of shaft area is not very great in such soft strata. The money, also, has been put up mainly by people who can afford to lose it if the ventures are not successful. It is to be hoped that their enthusiasm will not take the form of large concentrating mills before ore-bodies, large enough to supply them, are opened.

One of these companies, the Black Hawk, has a two-compartment shaft 6x12 ft. in the clear, put down 145 ft. and timbered with 6x8-in. pine. It is lined with 2-in planks. The mine is equipped with an 80-h.p. boiler and a 75-h.p. engine. Two 14-in. walking-beam pumps are installed, but only one of them has to be used. A small Gardner compressor furnishes air to a Little Wonder air-hammer drill. Four men work in the shaft—2 drill men at $3.50, and two muckers. As soon as a hole is drilled it is loaded and fired; otherwise, it would fill up immediately with sand. These holes are drilled 2½ to 3 ft. deep with not much trouble from the air-hammer drills. A small Freeman hoist having a 24-in. drum and using a ¾-in. rope and bucket is employed for hoisting the ore.

They are following down a vertical crevice 3 ft. wide. This contains stringers of lead ramifying through a filling of ocher. It has been traced by old workings for a distance of 600 ft., near the surface, but the present company is sinking, in the hope of striking a flat.

Another company near Elizabeth, which is sinking a three-compartment shaft, is the Kansas Lead Company. Its shaft is timbered with 6x8-in. sets, 5 ft. apart. It is being sunk at the intersection of two old lead ranges, and is now 88 ft. deep. As water has been met, the company is putting in an 85-h.p. boiler and a large engine to run two 14-in. walking-beam pumps. A small donkey engine has been used for sinking thus far.

BLACK HAWK MINE, ELIZABETH, ILL.

Four or five miles from town the Columbia Lead Company is sinking a three-compartment shaft, on what is said to be a highly mineralized range. This has only recently been found, and it is claimed that in 1902 and 1903 two men mined 200,000 lb. of lead from the ground now leased by this company.

It is said that these shafts cost about $25 a foot to sink, including timbering, powder, etc. Pine timber costs $27 per thousand at Elizabeth. Little Wonder hammer drills are used in shaft sinking.

The Skene mine is the only one in the district now producing lead. This deposit was discovered in 1900 and was worked by local people, until the Elizabeth Mining and Milling Company was formed. It leased the ground on a 10-per cent. royalty basis and began mining. It persevered until May, 1905, when a clack valve on the pump broke, and the mine filled with water to a depth of 44 ft. The Elizabeth company then quit mining and in July, 1905, the present company, the Skene Lead Company, was organized. The Elizabeth company used only a crusher and some hand jigs to treat the ore, but even with this meager equipment it is said to have produced 2,088,730 lb. of lead in one of the years that it worked.

The present equipment of the mine has been installed by the Skene Lead Company since July 1, 1905.

The Skene orebody occurs in the upper part of the Galena limestone. It has a general east and west trend, but it is crescent-shaped, the horns pointing to the north, while the dip, which is about 45 deg., is toward the south. The deposit varies considerably in width, sometimes being 10 or 12 ft., other times only 3 ft. wide, but the average width is 7 or 8 ft. The ore occurs as stringers and larger bunches of galena crystals scattered along the vein, while the whole vein filling is more or less sprinkled with lead crystals. It is said that the deposit averages 7 to 10 per cent. lead. There is some pyrite but no jack associated with the ores. In the bottom of the mine the crevice has begun to form a "flat," following the bedding underneath a flinty stratum.

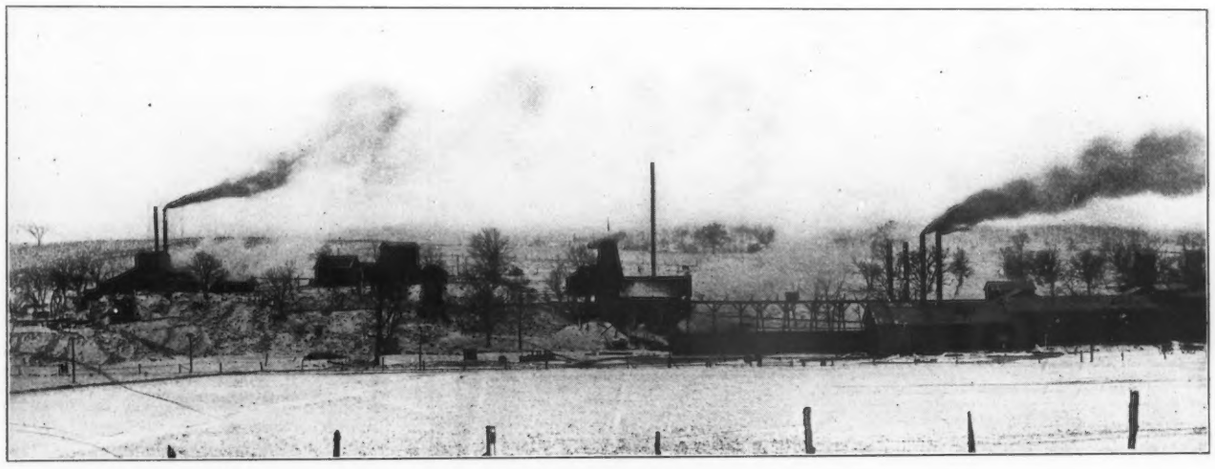
The mine is opened by shafts, but only three are used at present. The depth of these is: No. 2, 125 ft.; No. 3, 115 ft.; No. 4, 110 ft. These all end at practically the same level, and it is only on account of the slope of the surface that they vary in depth. The company, having confidence in the permanence of the deposit, has intentionally proceeded as though this had been proved.

The mine, when worked by the Elizabeth company, had only one working shaft, No. 2, and through this all the pumping and hoisting was done. As the main source of water was at the west end of the deposit, the present company decided to put in another shaft, No. 4, and to install pumps to catch the water before it comes all the way through the mine. At present the company has four 14-in. Cornish pumps installed, two at each of these shafts. This alows the pumping of 3000 gal. of water per minute if necessary. Just now, about half that amount is pumped. This large flow is not normal to the district, and is probably due to the fact that a good-sized creek flows right over the mine. It might prove a good plan to flume this creek past the mine.

The company has also sunk a four-compartment shaft, timbered with 8x6-in. sets, each compartment being 5x5 ft. in the clear. These sets are placed 5 ft. apart and swung on ordinary shaft hangers. The shaft is lined with 2-inch planks, and the hoisting compartment is partitioned off. This is going to be the permanent shaft, and it is the intention to put pumps, air pipes and ladder in one of the compartments, while two others are to be equipped with cages, and the remaining one is to be used for lowering timbers, tools, etc. Cars will then be used in mining, but at present buckets holding 500 or 1000 lb. of ore are used, and all ore is raised through No. 2 shaft.

The orebody is being worked by underhand stoping. Pillars of ore have been left from time to time, and a few stulls also have been put in on which to lay lagging where some of the waste has been stored. No. 2 Sullivan air drills are used to break the ore. The company is at present doing considerable development work, and is also clearing up lots of the old dirt left in the mine by the former company, for the present mill can treat this dirt at a profit. At present, about 75 tons of ore are hoisted each shift (9 hours). Forty- and 50-per cent. dynamite is used, and all firing is done by a powder man and helper who load and fire all the holes, by cap and fuse.

The ore is hoisted in buckets through No. 3 shaft in 500- or 1000-lb. buckets by a small steam hoist. It is dumped from the bucket into a car which empties into a 5-ton hopper. From this the ore is drawn into an automatically dumping car attached to an endless rope, which draws it up an incline to the mill bin.



SKENE MINE AND MILL, ELIZABETH, ILL.

The surface equipment of the mine consists as follows:

No. 2 shaft—Crosshead Cornish pump with 70-h.p. engine to run it; hoister, and two 80-h.p. tubular boilers, one of which is used at a time. A geared direct-current electric hoist is also installed. Only one of the boilers is used at a time.

No. 3 shaft—This is the four-compartment shaft. It is to be equipped with a double-drum electric hoist and a single-drum electric hoist.

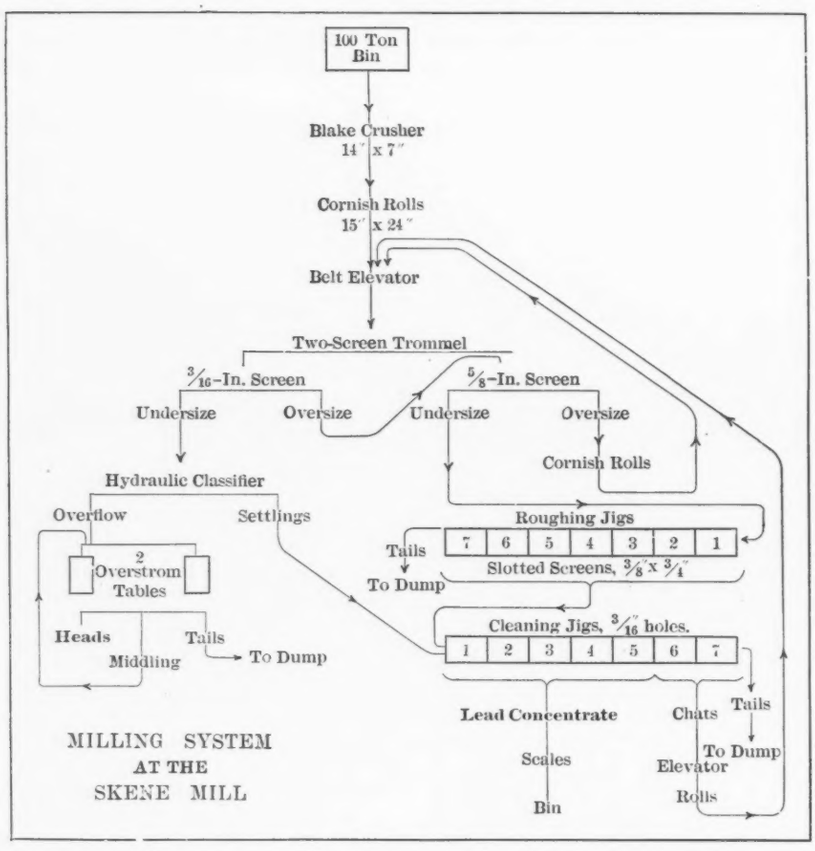
No. 4 shaft—This has two walking-beam, 14-in. pumps and a hoister. The steam to run this hoist comes either from the mill or from the boilers at No. 2 shaft.

At the mill is a fine modern power plant. This consists of two 80-h.p., and two 100-h.p. Atlas boilers, three of which are run at a time. A 250-h.p. Corliss engine, which runs a 100-kw., 250-volt, 400-ampere dynamo, is intended also to run a similar one which will furnish power to the Black Hawk Mining Company. This engine also furnishes power to the mill. There is also a large Blaisdell 2-stage compressor having 18x12x12-in. cylinders, running at 150 r.p.m., and dis-

charging into an air receiver which blows off at 80 lb. per sq.in. There is also a small geared hoist which pulls the ore up the incline to the mill from the hopper near No. 2 shaft.

The mill is capable of treating 100 tons of ore in ten hours and is run two 10-hour shifts per day. The company now produces about 30 tons of concentrate per week, for it is running poorer dirt than the average. The concentrate is taken to the car in canvas sacks which hold 200 lb. net. A large bin was erected near the railroad track, but this cannot be used in winter, because the concentrate freezes.

The details of milling are shown in



MILLING SYSTEM AT THE SKENE MILL

the accompanying diagram. The labor employed at the mill comprises a head jig man, a helper and a feeder.

Wages in the mine are as follows: Machine runner, 35c. per hour provided that an average of 60 ft. of holes per shift is maintained for a month; machine helper, 25c.; mucker, 20c.; top man, 20c.; hoister man, 25c. per hour. The above workmen are on duty for nine hours. Engineer, doing his own firing on a 12-hour shift, $75 per month. Wages at the mill, where men are on duty for 10 hours: The head jig man, $125 per month; helper, $75 per month; feeder 20c. per hour. The engineer at the mill, on duty for 12 hours, gets $100 per month, and his fireman (8 hours) gets 25c. per hour.

The company has a large office at Elizabeth, where the accounts of all the companies operating in the district are kept, all being under one management.

The Wall Jig.

At the mill of the Newhouse mine and smelter, at Newhouse, Utah, there are two Wall jigs, one of three compartments, and the other of one compartment, the latter being a "bull" jig. At present these jigs are not in commission, the management of this plant planning to use them for rewashing the concentrates, or reducing the silica in the latter. According to a report from this mill, there is no question that the Wall jig is a good machine, and thoroughly adapted for the concentration of silver-lead and zinc ores. It will compare favorably with the ordinary Harz jig, and the three-compartment Wall jig at the Newhouse mill will take care of the feed of three Harz jigs.

The Wall jig is similar to the Hancock jig in many respects, having practically the same motion, but in the Wall jig each compartment is separate, and allows for an independent stroke and water supply; its screening capacity is so great, however, that it is not adapted to such ore as that of the Newhouse mine, and it would hardly be recommended for heavily mineralized ores, such as occur at Park City, Utah.

The production of iron ore in Finland in 1904 was 47,213 metric tons, of which 37,887 was lake ore. There were 12 blast furnaces in operation at 11 works, their total production being 16,165 tons of pig iron. The production of bar iron and steel was 21,492 tons.

Utah Iron Ores.

The United States Geological Survey is at work in the Iron county iron ore field of southwestern Utah, and C. Kenneth Leith, of Madison, Wis., has a large party there this summer. Mr. Leith has been making headquarters at Cedar City, Utah, but has covered the district not only about that place and Desert mound, but many miles southwest, in the Pilot mountains, where it is now evident that large deposits of iron ore may exist. The Pilot mountain field is an extension of the older known deposits of Iron county, and is now under exploration by Messrs. Milner, of Salt Lake City, and others, with many crews. Ore exists close to the surface in many localities, and is of high grade. Sufficient work has not been done to prove much as to the extent and character of the formation, which seems like that of Cedar City, etc. The ore-bearing zone of southwest Utah is now known to extend for many miles; indeed it has been proved more or less continuously from the village of Parowan, which is east of Desert Mound, to the Pilot peaks, which are 60 miles southwesterly. There is a considerable space between the village of Pinto and the Pilots where ore has not been found, and may not be, for the district is full of extinct volcanoes and is covered with lava; but in general character the ores of the two ends of this long district are quite similar. The region is as yet rather difficult of access and the Pilots are surrounded by cañons and peaks that will make railway building a serious undertaking.

George Albu has given some facts as to the value of the pyritic leader recently discovered in the Meyer & Charlton mine, Transvaal. Where first discovered, near the 14th level, it was composed of alternate layers of pyrite and quartzite, and assaying 12 dwt. over 8 ft.6 in., while on the 13th level it assayed as high as 17 dwt.over 36 in. At the 13th level its value fell to 4½ dwt. over 36 in., where the leader has been transformed into a kind of bastard banket. As the same leader has been not only proved in neighboring mines, but likewise in mines some distance away, the discovery is of more importance than at first seemed likely; but the leader changes very much in value and character, needing thorough development before its actual value can be ascertained. At the Geldenhuis estate it is claimed that this identical leader has been worked with profit for some time, while its existence at other mines in the Central Rand seems also to have been known for some time.

An English company is mining the amblygonite (phosphate of aluminum and lithium) deposit of Carceres. The amblygonite is sold to a Paris chemical works, its value depending upon the percentage of lithia.

The Cone Gas Producer.

BY W. H. CONE.

Allowance of patents on a new form of gas producer, especially adapted to gasifying soft coal and utilizing the heating value of the tar, has recently been secured. In this generator, the fuel is divided into two separate zones. The lower one, where complete combustion takes place, is called the primary zone, and the upper one, where the coal is distilled and the volatile hydrocarbons driven off, is called the secondary zone.

The upper and lower fuel zones are separated by an annular chamber which encircles the fuel column, about midway. Running through the annular chamber to the fuel, are a number of small holes, through which the upper fuel is supplied with steam. The air is supplied to the lower zone through a rose or nozzle shown at 4 in the accompanying illustration, Fig. 1. By this arrangement, an excess of steam can be supplied to the upper fuel zone without interfering with the process of combustion in the lower fuel zone, thereby allowing the incandescent fuel in the lower zone to remain in an uninterrupted state; in other words, allowing complete combustion to take place uninterrupted by the steam. The annular chamber serves as a boiler where the steam is generated rapidly.

The product of complete combustion, CO_2, in ascending through and permeating the fuel in the upper zone, is supplied with another atom of carbon and becomes regenerated to CO, while the excess of oxygen supplied by the dissociation of the elements of the steam supply (H_2O) unites with the free carbon to form monoxide, and the hydrogen unites with the inert nitrogen of the air supply to form ammonia.

The union of the elements which form tar is arrested by this arrangement, and the excess of carbon is taken up by the excess of oxygen supplied. The fuel in the primary zone is always kept at a high state of combustion, and not interfered with by an addition of water vapor. The fuel in the upper zone is coked, and as the fuel in the lower zone is converted to ash this coked fuel descends to take its place. By inserting a superheater immediately above the secondary fuel zone, means is provided for eliminating or extracting the heat from the gases as they ascend and returning the heat so obtained back to the primary zone, through the air supply.

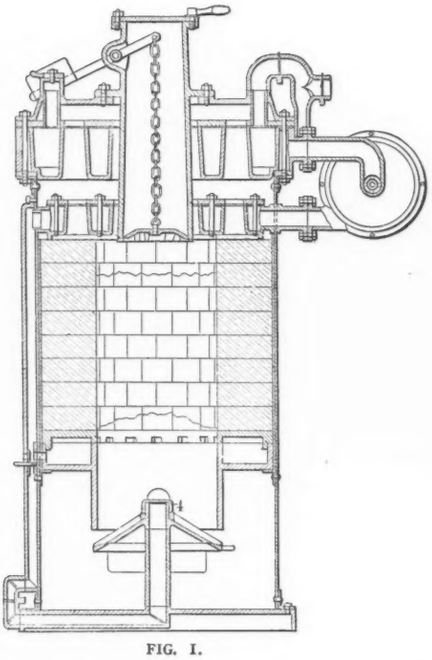
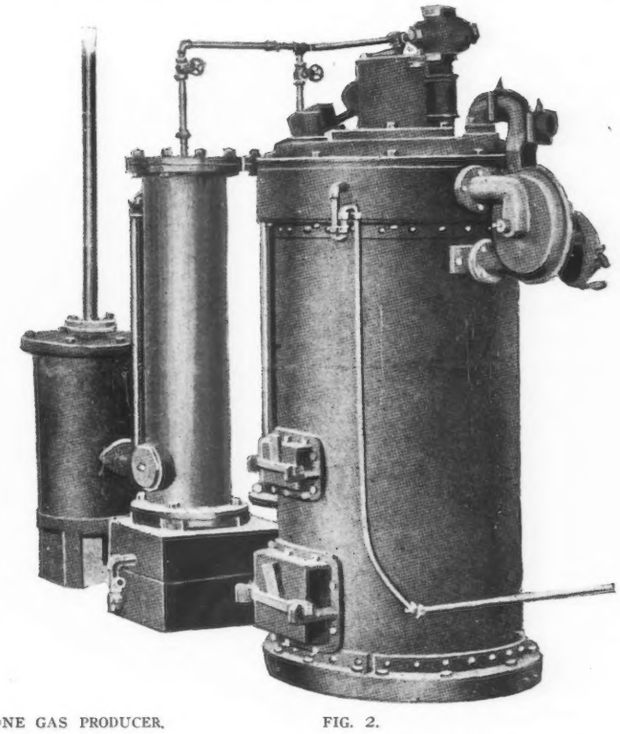


FIG. 1.



CONE GAS PRODUCER. FIG. 2.

Mining and Metallurgy in France.

BY MATTHEW VINGOE.

The strike movement which spread over France during the early part of May died out very slowly and led to a semi-stagnation in the metallurgical industry, from which it is slowly emerging. The importations of steel, iron, coal and the principal metals during the first five months of 1906 show considerable increases over the same figures for 1905, while the exportations of the same materials vary from 20 to 40 per cent. below figures for 1905. While this state of affairs is lamented very generally in the technical press, it is also remarked that the real consumption in France of metals other than iron, which alone is produced here in any considerable quantity, has remained stationary for the past two or three years, in spite of the fact that the consumption in Germany, Britain and America has augmented considerably.

The unhappy state of capital and labor questions here has given rise to many heated arguments and parliamentary debates and recently a ministerial declaration was read in the Chamber of Deputies of which the following are the points relating to the mining industries. The declaration, after commenting upon the ever increasing conflicts between capital and labor, states that serious study is being made to avoid the return of these annual troubles, and to this end a law would be drawn up defining the obligations and rights resulting from a working contract. The law in question would tend to promote conciliation between masters and men, define individual liberty and protect the weak. The same idea will inspire another law covering the hours of work, regarding which the declaration goes on to say that, without losing sight of the world's competition and the fact that a certain progress in this line among all competing nations is becoming more noticeable, leading to recognized working agreements, it is possible and even necessary to give satisfaction to popular demands, and to this end laws would be proposed regarding the weekly day of rest, payment of salaries and arbitration between masters and men. The old laws enacted in 1810 regarding conditions of working in and concessions given for mines, will be reformed; the Courrières catastrophe is responsible for the important modifications now being considered.

Fuel Efficiency of Cement Kilns.*

The first rotary kilns used in America for cement burning were 30 ft. long. This length was increased to 40 ft., and finally to 60 ft. for kilns burning dry materials and to 90 ft. for kilns burning wet materials, and at these lengths the advance stopped for a number of years. The great majority of American cement plants are today equipped with 60-ft. kilns 6 and 7 ft. in diameter. In 1904 Thomas A. Edison installed and put in operation at the Edison cement works two kilns 150 ft. long and 9 ft. in diameter. The result of the experiment was successful and cement works engineers, following Edison's lead, began to increase the size of their kilns. None of them felt quite inclined to make the jump from 60 ft. to 150 ft., that he had made, but kilns 100 ft. long, 125 ft. long, and, now 136 ft. long, began to be designed and installed with increasing frequency. It is natural to inquire why this change of practice should come about.

The rotary cement kiln is not an economical thermal device. It is very wasteful of fuel, its economy and efficiency as a means for calcining cement mixtures to clinker comes from the economy of handling material and not from high efficiency; it requires about 40 lb. of coal to burn one barrel of cement with a vertical kiln, while it requires 100 to 200 lb. of coal to burn one barrel of cement in a rotary kiln. In the case of the vertical kiln the raw material, after being reduced to powder, has to be molded into blocks, which are charged by hand into the kiln, and finally, when burning is completed, the blocks have to be sorted by hand to remove those imperfectly burned, and then crushed before the clinker can be admitted to the grinding machines. The rotary kiln takes the powdered raw material, dry or wet, by mechanical feed and burns it to clinkers varying from the size of a pea to the size of a walnut; it can then be fed directly to the grinding machines; there is no molding of blocks involving preliminary drying with wet mixtures and preliminary wetting with dry mixtures, no sorting out and discarding of underburned material, and no preliminary crushing of the clinker. It is in the saving effected in handling the material and not in its efficiency as a furnace, that the economy of the rotary cement kiln exists.

Several devices have been suggested for improving the thermal efficiency of the rotary cement kiln. It has been proposed to use two jets of coal dust; to water-jacket the hottest zone as is done in blast furnaces; to jacket the kiln to reduce loss of heat by radiation; to introduce interior ribs to retard the movement of the material, and to do various other things. None of these remedies has gotten beyond an individual installation and many of them exist only on paper. In fact, the only method suggested for improving kiln efficiency that has been taken up in actual practice is that of lengthening the kiln cylinder. This method is gaining continually increasing favor.

In a general way it is evident that by making the kiln longer the gases of combustion are compelled to leave the kiln at a lower temperature, and hence, a part of the heat now wasted in the shorter kilns is rendered useful, but it is a question as to how much the gain thus made amounts.

Taking the few and incomplete data at hand, we find a notable economy in fuel resulting from the use of long kilns. When Edison's kilns 150 ft. long and 9 ft. in diameter were first installed the managers of the works stated that the monthly average of each kiln was 30 bbl. of cement per hour with a coal consumption of 80 lb. per barrel. The output of 60-ft. kilns working on practically the same material is from 7 to 10 bbl. per hour with a coal consumption of 80 to 140 lb. per bbl. Referring to the Edison kiln, A. V. Bleininger states that its fuel consumption probably approaches quite closely to 50 lb. per barrel. In a recent discussion of rotary kiln efficiency the German authority, W. Michaelis, Jr., states that rotary kilns 90 ft. long are in use in Germany that, burning dry materials, turn out 300 bbl. per day with a fuel consumption of from 60 to 75 lb. of coal per bbl. This economy is not due alone to the increased kiln length, however, but is brought about in part by supplementary devices for regulating the admission of raw materials, fuel and air to the kiln.

Figures of actual cement output and actual fuel consumption collected by E. C. Eckel and published in his *Cements, Limes and Plasters*, show that 60-ft. kilns working on cement rock and limestone may be expected to produce from 180 to 250 bbl. of cement per kiln with a fuel consumption of from 85 to 160 lb. of powdered coal per bbl., while 80-ft. kilns working on the same material may be expected to produce 225 to 300 bbl. per day per kiln, with a fuel consumption of from 85 to 120 lb. of coal per bbl. The same authority states that the 150-ft. kilns of the Edison works turn out 375 bbl. of cement per kiln per day with a fuel consumption of 65 lb. of coal per bbl., and this with practically the same material as gives the figures quoted previously for 60- and 80-ft. kilns. This material, the cement rock and limestone mixture of the Lehigh cement district, is noted, however, for its remarkably easy clinkering. A 60 ft. kiln working on limestone and clay, will on the average, record neither so great an output nor so small a fuel consumption.

One plant tested uses a wet mixture containing 52 per cent. water and burns it with a local coal having a heat value of 10,094 B.t.u. With its 100-ft. kiln it gives an output of 166 bbl. of cement per kiln per day with a fuel consumption of 180 lb. of coal per bbl. These are very satisfactory results, as a brief examination will demonstrate.

E. C. Soper, who reports this test, figures from his records that there is a saving of 48 lb. of coal per bbl. of cement as compared with a 60-ft. kiln working under the same conditions. E. C. Eckel (in the treatise quoted) gives a record of a 100-ft. kiln burning a wet mixture that produces 135 bbl. of cement per day with a fuel consumption of 150 lb. of coal per bbl. Using the same material he gives the following figures as the results that may be expected from the kilns of the lengths more commonly used: For 60-ft. kilns an output of 60 to 140 bbl., with a fuel consumption of 150 to 250 lb. per bbl.; for 80-90-ft. kilns an output of 80 to 150 bbl., with a fuel consumption of 140 to 220 lb. per barrel.

Though these records of long kiln efficiency are of rather haphazard character, it will be observed that they all agree in showing a decided gain both in output and in fuel economy resulting from the increase in length. This gain is obtained whether the kiln is working on a dry mixture or a slurry, though naturally it may be expected to be smaller with the wet mixtures. In view of these facts it is apparent why cement mill engineers should, after having apparently settled down to the use of 60-ft. kilns, suddenly begin to build kilns twice that length; it is quite certain that in the future few new cement plants will be fitted with kilns less than 100 ft. long.

It may not be supposed, however, that the solution of the problem of rotary kiln fuel economy afforded by lengthening the cylinder lacks objections. The cost of the kiln plant is in the first place greatly increased; this is true even in new plants where everything is planned on the basis of long kilns. In many existing plants lengthening the kiln necessitates the reconstruction of a large part of the remaining plant and buildings to give room for the larger kiln units. It may readily occur, therefore, that some method of utilizing or regenerating the heat wasted from the kiln will be a far more economical means of reducing the losses now suffered than will the introduction of long kilns. Practically speaking, only two methods of utilizing waste kiln heat in cement mills have been seriously taken up in America. One method is to trap the hot gases coming from the kiln and pass them under boilers for generating steam; the other method is to utilize the heat from the cooling clinkers to preheat the air used in combustion in the kiln. Papers by A. B. Helbig in *Engineering News* (Feb. 16, 1905), and by R. C. Carpenter in the Sibley *Journal of Engineering* (March, 1904), give further details regarding each of these methods.

*Abstract of paper in *Engineering News*.

Electrically-Operated Ventilating Plant in Northberg Pit, Germany.

BY ALFRED GRADENWITZ.*

When an electrically-driven pit ventilator was recently installed in the air shaft of the Northberg pit at Eschweiler-Aue, Germany, the electrical company designed a remarkable arrangement, to utilize the advantages of alternating currents in the transmission of energy.

A pit ventilator, running at two speeds, 300 and 357 r.p.m., and of 80-160 h.p., had to be driven from a power station 4 km. distant, where direct current at 550 volts was available, reserve was afforded by an accumulator installation. Owing to the relatively great distance of the central station from the ventilating plant, immediate transmission of the available direct current was undesirable, though simplicity of speed regulation would have been obtained by this means. By using ordinary A. C. methods, however, sufficient simplicity and economy in regulation could not have been obtained. The alternating current used to operate the ventilating plant serves other purposes as well; and for this reason a constant primary frequency is required.

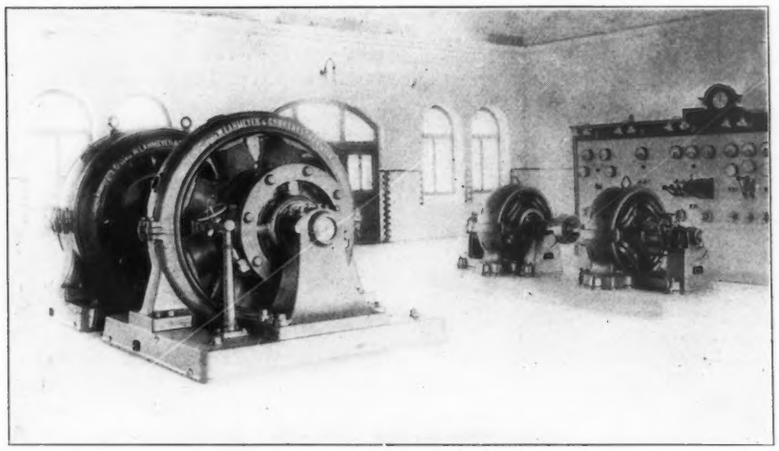


FIG. 1. TRANSFORMER STATION.

The power station above referred to is near the "Centrum" pit, where current at 550 volts is available; this is generated at the power station of the "Concordia Hutte" and "Herrenkuns" pits. A step-up transformer station (Fig. 1) converts the direct current into 5500 volts A. C.; this is near the "Centrum" pit and includes two motor generators, each consisting of a shunt motor coupled to a 210 kw. A. C. generator with exciter, operating at 375 r.p.m. An accumulator is arranged to work in parallel with the D. C. motor; it has a capacity of about 1200 amp. hours at a three-hour discharge rate; it is charged by the set shown in Fig. 1. Whenever the current supply from the generating station is discontinued, operation can be maintained for fully three hours by means of this battery. The machine gives 175-250 amperes at 100-300 volts and 600 revolutions per minute.

A triple-iron-band-armored high-tension cable about 2600 m. long runs from the Centrum transformer station to the "Northberg" pit engine house, where a steam engine of 140 h.p. (which was formerly used to operate the ventilator, together with a 5500 volt A. C. generator) constitutes another reserve.

The "Northberg" switchboard is connected by a double underground cable about 1400 m. in length to the ventilating fan motors located at the air-shaft, means being provided to connect the transmission line from "Centrum" and the Northberg reserve set, to each of the cables leading to the ventilator. The latter was supplied by R. W. Dinnendahl Ltd., of Steele, and is designed according to the Capell patent double suction type. It is installed above ground and connected to the air-shafts by two channels under the floor, leading to either side of the ventilator. The ventilator draws in the air from two sides, avoiding axial side thrust. The ventilator housing above the floor, as well as the two casings above the suction channels, is made of sheet steel with iron reinforcing and is mounted on a cast-iron foundation frame, carrying the bearings. These are of white metal, provided with ring lubrication and leather tightening to prevent oil issuing from or dust penetrating to the inside.

The flywheel is 2.75 m. diam., and 1.4 m. face; the discharge funnel, 5 m. above the middle of the axle and having a free discharge opening 2.16x2.78 m., is made of Monier concrete. The output of the ventilator is as follows: Normal; 2080 cu. m. of air per min. with 120 mm. depression, at 300 r.p.m., and an absorption of energy of 80 effective h.p. Maximum; 2570 cu. m. per minute with 185 mm. depression, at 370 r.p.m. and 136 h.p. In order to insure this variability in speed, the ventilator has been connected on either side to an asynchronous motor of 80 h.p. (Fig. 2) running at 375 r.p.m., with an extension on one side to a synchronous machine of 16 h.p. With the higher speed the two asynchronous motors work in parallel, giving an aggregate capacity of 160 h.p. at 375 r.p.m. In order to insure 300 r.p.m. with 80 h.p., one of the asynchronous motors has been coupled to the synchronous machine in a novel manner. In order to illustrate this coupling, further consideration will be required:

The asynchronous motor depends for its operation upon the fact that the revolving field generated in the stator induces secondary currents in the rotor. The phase difference being 120 deg., the induced current, in conjunction with the differing phase relation, produces the required torque. The intensity of the current and accordingly the magnitude of the turning moment obviously depends on the rotor e.m.f., which is proportional to the speed of rotation of the rotor in regard to the stator field. The closer the speed of rotation of the rotor approaches the speed of rotation of the stator, the smaller the induced electromotive force will be, as well as the current and the torque, and *vice versa*.

When running at no load, the number of rotations of the rotor is nearly identical with the speed of rotation of the stator; and the induced current is weak, corresponding to the low current required for overcoming friction.

As the load increases, the rotor slows down with regard to the rotary field, i.e. it "lags," while by the resulting higher relative speed between the rotor and field, a more intense current is generated in the former, up to the point where the resulting torque is sufficient to overcome the external resistance. To each given value of the rotary moment a given e.m.f. intensity and given lag, i.e. a given speed, thus follows. If resistances be now inserted

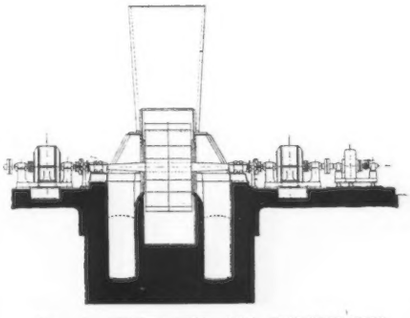


FIG. 2. VENTILATOR AND CONNECTIONS.

in the rotor circuit with a certain value of the torque, part of the induced e.m.f. will be absorbed in the latter, the current and torque tending at first to drop. In order to raise these magnitudes to the required figures, the rotor should go on lagging until its relative speed with regard to the field is sufficient to produce an e.m.f. susceptible of creating the required current intensity with the increased resistance of the circuit, when equilibrium will be

*Berlin W. 35, Korner Strasse 25.

re-established. Thence, it is seen, that by inserting resistance in the rotor circuit, the speed of rotation of asynchronous motors can be reduced (which however impairs the efficiency, the absorbed tension constituting an amount of energy which is lost). This means of regulation is uneconomical.

The system used by the Lehmeyer Company in connection with the present ventilating fan, is based on the fact that the energy otherwise converted into heat resistance can be recovered by using it in a motor coupled and restoring to the working shaft the largest part of the energy concerned.

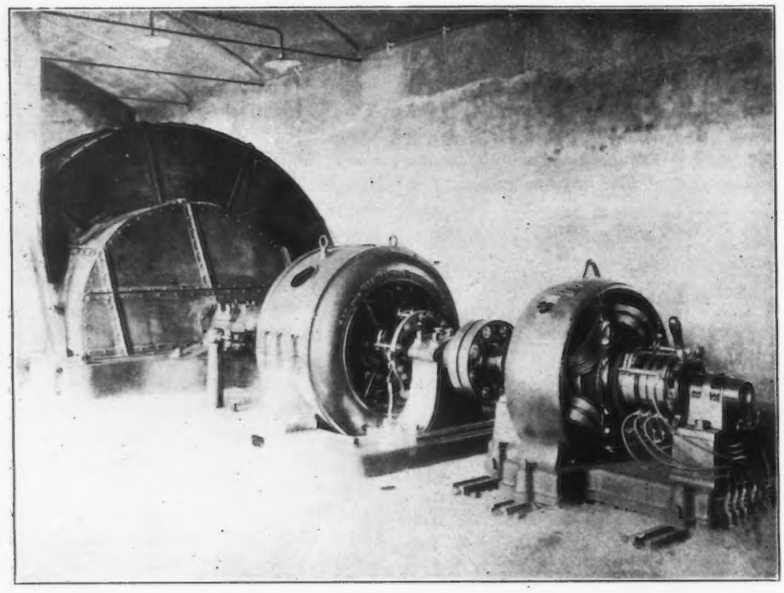


FIG. 3. VENTILATOR MOTORS.

For this purpose the synchronous machne referred to above is used. This is designed like a rotary transformer, being

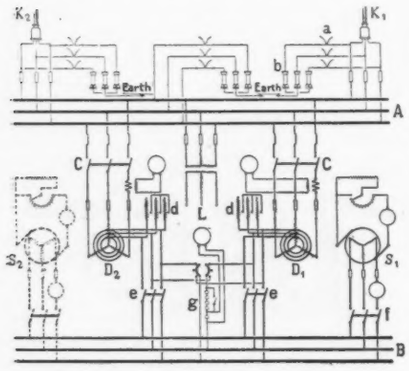


FIG. 4. DIAGRAM OF FAN CONNECTIONS.

provided with three sliding rings connected to the armature windings, to which is supplied the current derived from the rotor of the asynchronous motor. The commutator shown in Fig. 3 supplies the direct current required for exciting. The number of poles of the synchronous machine is dependent on the condition that its rotative speed with the frequency supplied should be equal to the lag of the asynchronous motor, with the desired 300 r.p.m. As the asynchronous motors have a (synchronous) number of revolutions (amounting to 375) while being fed with current at 100 cycles, the frequency of the lag with 300 rotations is inferred from the equation.

$$375 : 100 = 300 : (100 - X).$$

being thus 20 per second, and the number of poles

$$\frac{20 \times 60 \times n}{300} = 4.$$

If, according to the asynchronous motor be operated with the lag corresponding to 300 r.p.m., the amount of energy corresponding to this lag is restored to the ventilator motors by the synchronous machine, which also runs at 300 r.p.m., thus avoiding any waste of energy in the resistance and insuring high efficiency.

The above agreement shows another advantage. The synchronous machine compensates for the displacement in phase inherent in the operation of any asynchronous motor. Any wattless currents are thus eliminated from the plant, which insures another improvement in the efficiency of transmission.

Fig. 4 shows the diagram of connections of the fan motors. K_1 and K_2 are the two cables leading from the engine-house to the airshaft, which are connected to the bus-bars A through intermediary high-tension oil fuses. The connections and bus-bars themselves are protected by patented high-tension fuses a, communicating with the earth through water resistances b. The high-tension oil fuses patented by the Lahmeyer Company, show a remarkable reliability in working and small space requirements, the later being due to the fact that the fuses are melted out, even with the highest tensions, without any arcing, for which reason they may be mounted in the immediate neighborhood of other apparatus. The high-tension fuses will prevent any detrimental effects of over-tension, as produced by resonance, etc, thus excluding the possibility of the machines or collectors being burnt out. The stators of the asychronous

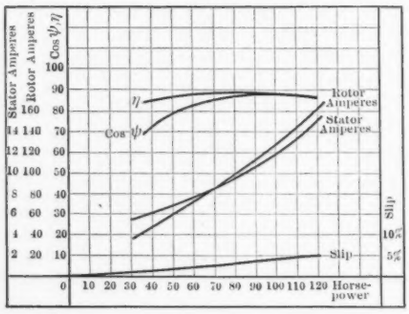


FIG. 5.

motors D_1 D_2 can be connected to the bus-bars A by the cutouts C. The motors are started by means of the starting resistances d, which may be connected to the sliding rings of the rotor. If the ventilator works at 375 r.p.m., absorbing 160 h.p., the motors will work in parallel. Should the ventilator have to work at 300 r.p.m., one of the motors (D_1 or D_2) is started by means of the starting resistance, the synchronous machine S_2 is excited, and the pair operated in parallel, as soon as they are in step. When operating on 80 h.p., the motor which is out of service could conveniently be disconnected to avoid friction loss. To this effect the asynchronous motors are each connected to the shaft by jaw clutches, to allow cutting out. The ventilator shaft may be coupled to another synchronous machine S_2 serving as a reserve by which the output can be raised to 160 h.p. even with 300 r.p.m., by simultaneous working with the other motor.

The curves representing the two means

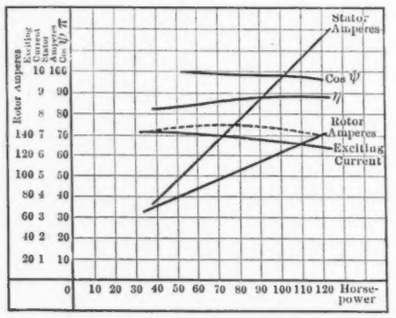


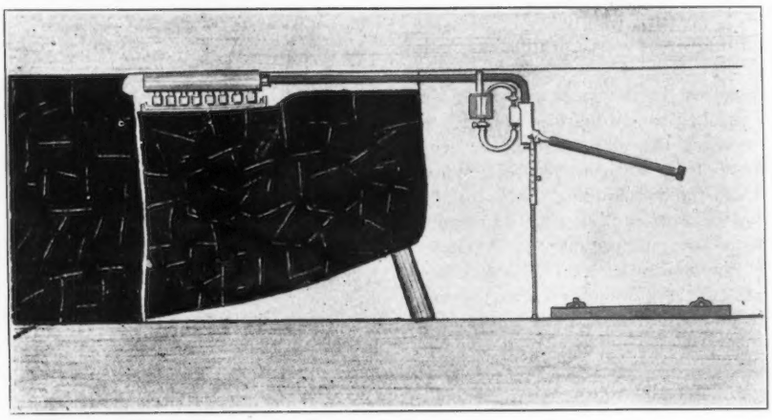
FIG. 6.

of working are shown in Figs. 5 and 6, relating to the working as a pure asynchronous motor at 375 r.p.m. The efficiency and cost are satisfactory in view of the relatively low speed and high number of poles for an output of 80 h.p. Fig. 6 illustrates synchronous operation at 300 r.p.m., cos ψ being nearly unity and the efficiency being satisfactory. The advant-

age due to this method is readily seen by comparing the efficiency curve with the dotted curve. The latter represents the efficiency in the event of a reduction in speed from 375 to 300 r.p.m. being effected by means of resistances inserted in the rotary circuit. The curve is nearly 15 per cent. lower with 80 h.p. than the curve obtained with the joint working of an asynchronous motor, as above described.

The Hydraulic Mining Cartridge.

Considerable attention has recently been directed to the new method of breaking down coal, by a small machine using hydraulic pressure, as a means for exerting tremendous power. When we speak of the method being new, we do not mean that it is in its experimental stage, but rather that up to the present time, no great effort has been made to put the cartridge on the market. It is, however, at the present time, being used in England and in mines on the continent. Claims are made that at one colliery where 1000 explosive shots were fired per week, the introduction of the cartridge has done away with the entire use of powder in the mine. In one coal seam, during a period of twelve months, the hydraulic cartridges produced 28,500 thrusts, bringing down 92,626 tons of coal. In this case, four cartridges were used, and the coal seam was 3 ft. thick.



THE HYDRAULIC MINING CARTRIDGE IN POSITION.

The claims of superiority for the cartridge are based, not only on its freedom from danger, but also on the fact that the coal is not shattered, little dust is made and coal is not wasted.

The cartridge consists of a cylinder of steel 20 in. long by 3 in. in diameter, and having eight small duplex rams fixed radially along it By a suitable arrangement of passages, a communication is made between each of these rams, whereby simultaneous action can be obtained. By an ingenious contrivance a greater traverse is obtained by these rams than the diameter of the cylinder would appear to allow. This traverse is essential for the complete forcing down of the coal, and the duplex arrangement is a speciality of the present cartridge. Thin liners are used to prevent rams cutting into the coal.

The cartridge is operated by a hydraulic pump to which it is connected by a pipe. The pump is of special design, is mounted on an adjustable stand, and fitted with a water tank. The water required for the whole of the operation is about 1½ pints, but most of this returns to the tank at completion, and can be used again. At the commencement of the operation, a small handle is used, and when pressure has increased, an extension handle is slipped over it, and greater power is thus exerted. A pressure of three tons per square inch can be reached, and this represents a total pressure on the coal of over 60 tons. This is found adequate in ordinary seams, and the standard sizes are made for this duty. Special cartridges are made for extraordinary conditions.

In operating the cartridge, after the extension handle is attached and the pressure fully on, the enormous power of the apparatus is soon apparent, for the coal is heard to rumble and crack. This is allowed to continue until the back portion of the coal is broken off, after which the sprags are slightly slackened. A continuance of the pumping brings pressure to bear at the front of the faces, and this pressure continues to spread until the operation is completed, when the sprags are withdrawn. The whole process occupies about 10 minutes.

It is not contended that this machine will get rock or coal out of the solid, for it is essentially necessary that the material be undercut, or have one loose side. The accompanying illustration is furnished by The Hydraulic Mining Cartridge Company, of 21 Mawdsley street, Bolton, England.

Carnotite has been discovered at Olary, South Australia, on the Broken Hill railway line, about 257 miles from Adelaide. An analysis has shown the carnotite to contain 63 per cent. uranium oxide and 10 to 20 per cent. of vanadic acid.

The Spontaneous Ignition of Coal.

BY VIVIAN B. LEWES.*

The storage of inflammable materal in large bulk causes dangers of a serious character, which do not exist when small quantities are stored. It is the increase in mass which in most cases leads to those actions which culminate in spontaneous ignition. Substances, especially those of vegetable origin, undergo slow oxidation at temperatures below the ignition point; and it is only the action being spread over a long interval that prevents our realizing that heat is being evolved. A certain increment of temperature, however, is generally needed to start slow combustion; but when once the required rise takes place and the operation commences, the surrounding mass of material retains the heat, the temperature increases and the ignition point is finally reached. The initial increase may be brought about in several ways——first, by physical action, as in the absorption of a large volume of gas and its compression in the pores of a substance; by a rise in atmospheric temperature; by a direct chemical action taking place at the ordinary temperature; and by the action of ferments on most organic matter. To the first class belongs the spontaneous ignition of a mass of powdered charcoal or lampblack.

Coal may be considered as consisting of carbon, hydrocarbons and inorganic constituents. Among these latter we find iron pyrites, which occurs sometimes as bright golden laminæ in the cleavage of the coal, sometimes as heavy and metallic lumps where it has formed in a cavity, and occasionally in a finely divided and feathery form spread through portions of the coal itself. If these pyrites are collected from the coal and made into a large heap exposed to air and moisture, they rapidly heat and often inflame, owing to the oxidizing action of the air and moisture upon the sulphur; and it is still believed by many observers that it is this action in the coal itself which gives rise to its spontaneous ignition.

A careful study of the phenomena occurring during the heating of a mass of coal, however, leads to the conviction that the pyrites present can only play a very subsidiary part, and that it is in reality the absorption of oxygen by the freshly won coal and the activity of the condensed gas in contact with the hydrocarbons of the coal that are the active factors in causing the ignition. In the coal seam the pores of the coal are filled with methane, or a mixture of methane and carbon dioxide. When this coal is mined and brought to the surface it exudes these gases and in turn absorbs oxygen from the air. As long as the pieces are fairly large no heat shows itself; but, as the coal gets more and more broken by handling

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and jolting during carriage, the surface becomes enormously increased. The mere absorption of the oxygen however, is insufficient to bring about serious consequences, unless there is an initial rise in temperature to start the action. In coal-cargo ships it is found in the increased air temperature while going through the tropics, in ship's bunkers by contact with the casings near the boilers, and in coal stores on shore by proximity to a steam pipe or a flue—it being found in every case that the spontaneous ignition of the coal started at the point where the cause of the initial rise of temperature was to be found.

The old idea as to the treatment of coal to prevent spontaneous ignition was to provide ventilation; but this is impossible in a cargo on board ship, and difficult in a coal store; the result generally being to supply just enough air to lead to dangerous heating. Moisture is a very powerful agent in aiding chemical action; and, as is well known, many forms of combination—such as the burning of carbon monoxide in oxygen, and even the combination of phosphorus with oxygen—are prevented if both the reacting substances are perfectly dry. In the same way, the action of the occluded oxygen in the coal is enormously aided by the presence of moisture; so that heavy rain while a coal cargo is being taken on board or stored, generally results in heating, and often active danger.

Both steam and water have failed to act successfully in extinguishng fires originating from spontaneous ignition in large masses of stored coal.

There are certain gases, however, which have a great power of stopping combustion by keeping away the oxygen of the air from the burning substance; and some of these have been proposed for the extinction of such fires. If we burn sulphur in oxygen, sulphur dioxide, with its choking smell, is generated; and this gas has a powerful effect in preventing and extinguishing fire, a small percentage of it being sufficient to extinguish flame. Its action, however, is purely extinctive and in no way cooling; and with a cargo on fire, the cooling down of the mass is every whit as important as the extinction of the active combustion. Another gas which acts in precisely the same way is carbon dioxide; but here again, if carbon dioxide be merely generated and pumped into the area containing the burning matter, no absolute cooling is effected; and though the use of these gases was suggested more than 30 years ago, it was this trouble which prevented their adoption.

When carbon dioxide is compressed under a pressure of 36 atmospheres at a temperature of 0 deg. C. it is condensed to the liquid state, and can be stored in steel vessels closed with screw valves. On opening the valve, some of the liquid is ejected into the air; and, being reduced to the ordinary atmospheric pressure, it is almost instantaneously converted into a large volume of gas. Conversion from the liquid to the gaseous state means absorption of a large amount of heat; and so great is this, that everything near the stream of new-born gas is cooled down, and some of the escaping liquid is frozen to a solid having a temperature of —78 deg. C. In applying it to coal cargoes, I suggested that small cylinders of carbon dioxide should be taken, and the nozzle attached to the screw valve on the bottle should have a short metal nose-piece screwed on to it, the tube of which should be cast solid with an alloy of lead, tin, bismuth and cadmium, which can be so made as to melt exactly at 93 deg. C. The valve should be opened, and the steel bottle buried in the coal during the process of loading. The temperature at which the fusible metal plug would melt would be well above the temperature that could be reached by any legitimate cause, and would mean that active heating was going on in the coal. Under these conditions, the pressure in the steel cylinder would have reached something like 1700 lb.; and the moment the plug melted, the whole contents of the bottle would be blown out of it into the surrounding coal, producing a large zone of intense cold, and cooling down the surrounding mass to a comparatively low temperature. The action, however, would not stop here, as the cold, heavy gas would remain in contact with the coal, diffusion taking place but slowly. When the coal has absorbed as much oxygen as it can, it still retains the power of absorbing a considerable volume of carbon dioxide. When the coal has heated and then been rapidly quenched, the amount of gas so absorbed is very large indeed; and the inert gas taken up remains in the pores of the coal, and prevents any further tendency to heating. A coal which has once heated, if only to a slight degree, and has then cooled down, is perfectly harmless, and will not heat a second time. It is possible to condense 100 cu.ft. of gas in the liquid state in a steel cylinder 1 ft. long and 3 in. in diam.; and as a ton of coal contains air spaces equal to about 12 cu.ft., one of these cylinders would have to be put in for every eight tons of coal, and they should be distributed evenly throughout the cargo, and near to alarm thermostats set to ring in the office or watchman's room when the temperature is a degree or two below the point at which the fusible plug would melt. The ringing of the bell would give warning that heating was taking place, and the bell would continue to ring until the cylinder had discharged its contents, and had cooled the mass down to a safe degree, the whole arrangement being purely automatic.

A wire rope having the strands twisted in opposite directions is generally non-spinning.

Missouri Coal.

We are indebted to J. W. Marsteller, secretary of the Bureau of Mines of Missouri, for a corrected statement of the production of coal in the State in 1905. The total mined last year was 4,379,090 short tons. The average price realized was $1.63 per ton, giving a total value of $7,141,983. Coal was mined in 36 counties, the more important production being in the following: Macon, 815,893; Adair, 708,388; Lafayette, 705,917; Randolph, 554,118; Ray, 226,369; Vernon, 206,772; Platte, 205,535; Boston, 196,175; Henry, 132,619 tons. No other county produced over 100,000 tons.

There were 488 mines in operation during the year, and the number of men employed was 10,401, showing an average of 421 tons mined per employee. A number of the mines reported are small operations, worked only for a part of the year.

There were 11 men killed and 26 injured by accident during the year; an average of 1.06 killed and 2.50 injured per 1000 employees. There were 139,645 kegs of powder used during the year, showing an average of 35 tons of coal broken down to one keg of powder.

Missouri is not a shipping region, nearly all of the coal mined in the State being used within its borders.

Coal in French Lorraine

An interesting discussion took place at the last meeting of the Societé de l' Industrie Minérale, regarding the newly discovered coal-beds in French Lorraine, regarding which French mining circles are rather sanguine. After a rapid sketch of the history of the discovery of the coal-beds, a resumé of recent soundings was given to the effect that at the depth of over 1000 meters there were several important seams of coal of over two meters in thickness. At 896 meters depth two seams have been found with a thickness of 2.65 meters (8 ft. 6 in.). As coal is considered workable down to a depth of 1000 meters at least, it is believed that the Lorraine coal basin will now be considered by the least sanguine as a workable scheme. The Lorraine basin is also interesting from the fact that traces of the presence of gold and silver were found in the district surveyed. Thus at Raucourt granite deposits with 36 to 40 grams of gold per metric ton were connected with the presence of silver to the amount of 245 grams per metric ton, the above figures representing the dross obtained in refining. Similar coal deposits have been located on the German side of the frontier and German companies are under formation for the exploitation of the coal-yielding territory.

Steam cannot be used economically unless worked expansively.

Colliery Notes.

For ordinary large props the crushing strain is about 1½ to 2 tons per sq.in., according to the age and seasoning.

The quantity of air circulating in a mine varies as the square root of the pressure, or the square root of the water-gage reading.

When coal is mined by machines, it is claimed that no advantage ever accrues from a shallower cut than 3 ft., and this may be stated as a minimum.

Blowers of fire-damp are most frequently liberated when the workings are approaching a fault. This condition is often preceded by an outflow of water.

In prospecting for coal with a churn drill, after reaching the seam it is possible to take out a core of the coal with a rotary drill of smaller diameter than the churn.

In machine mining, the relation of the line of machine face to the cleavage planes in the coal and in the stratum which forms the roof, is in many cases of vital importance.

"Chop" keeps mine horses and mules in harder and better condition than soft food. Bran has little value, except as a laxative and should only be used sparingly as an occasional change.

The velocity of the air traveling along the faces of rooms and entries in a fiery mine, where naked lamps are used, should never be less than 120 ft. per min., nor more than 300 ft. per minute. In main airways the current velocity should be from 300 to 600 ft. per minute.

The strength of pillars of timber of equal sectional areas, is inversely proportional to the square of the length. Taking pillars of the same sectional area, one 2 ft. in length has sixteen times the strength of one 8 ft. in length and four times that of one 4 ft. in length.

It is estimated that an 8-ft. seam of Connellsville coal, free from faults, when carefully mined, will yield 12,000 tons of coal per acre, or 8000 tons of coke. Taking 600 tons as the work of a 12-ft. beehive oven for one year, an acre of coal will keep one coke oven running steadily for 13⅓ years.

A coal-cutter should never be allowed to get out of condition; to work it so is the worst kind of extravagance. To drive a machine with slack bearings and loose joints is to subject it to very violent shocks and strains, and those responsible for such operation have none but themselves to blame when the inevitable breakdown occurs.

In timbering the face of a working place, single props should be set with a "lid" or "bonnet" on top. This lid gives additional resistance to the prop, and spreads the pressure over a larger area. It is also advisable where the floor is hard, to point the props, so that they will crush up when the pressure comes on, and grip the floor, thus preventing sliding away at the foot.

Where pressure is great and gas issues from the coal with a hissing noise, a vent of this kind is called a "blower." These blowers sometimes continue to give off fire-damp for long periods, showing that they communicate with reservoirs of gas. It is interesting to know that at some places the pressure present at these blowers has been measured, and results prove that this pressure varies from 460 to 900 lb. per square inch.

In dealing with coal dust to prevent its adding to and increasing the effect of a mine explosion, various methods such as removing, wetting, etc., have been tried. It has been found that dampening the dust with salt gives better results than watering, but is more expensive. Salt water has also been used and gives good results, as it tends to form a deposit over the particles, keeps the dust in a moist condition longer, and has a binding or caking action.

Coke for use in blast-furnace work producing bessemer pig, should not contain more than one per cent. sulphur as a maximum. The sulphur confers on pig metal the undesirable property of red-shortness, which means that the metal is in a brittle condition when hot. Phosphorus is also undesirable, producing an opposite quality in the metal, called cold-shortness. Practically none of the phosphorus in the coal is eliminated in the process of coking or washing.

In mining by longwall when a large yield and economical methods are desired, it is found that better results are obtained if the face is moved forward regularly and evenly every day; also the distance between two stall roads must not be too long, or the output will be limited. On the other hand, if the roads are too close together, the expense of maintenance becomes too great. Roads driven from 100 to 150 ft. apart have been found to give the best results.

Black-damp does not issue at high pressure from freshly-cut coal in the same way as fire-damp; and coal, which has had sufficient time to drain off all its other gases, may continue for years to produce black-damp. The formation of the latter gas is due principally to the oxidation of the coal or associated strata. Black-damp having neither taste, color, nor smell, can, however, be detected by passing a quantity of the suspected air through lime-water, when, if the gas is present the water will turn milky.

In ventilating a coal mine, increased benefit is derived by splitting the air-current. This system increases the rubbing surfaces, but reduces the velocity with the same pressure, and as the rubbing surface and velocity squared vary as the pressure, a larger quantity of air can be propelled by a given power. Splitting the air also requires fewer trap-doors, and insures a more uniform supply; also in case of a fall of roof or an explosion occurring in one section, the results are not disastrous to the whole system.

The quantity of hydrogen available for heating purposes in any fuel is not the total amount of that element present, but only that portion of it which is in excess of the quantity required to form water with the oxygen contained in the coal. The amount of disposable hydrogen in any coal can be ascertained, when the composition of the coal is known, by dividing the quantity of oxygen present by 8 and subtracting the result obtained from the total quantity of hydrogen present, the remainder being the disposable hydrogen.

The moisture, fixed carbon, ash and sulphur, may differ widely in good coking coals, without seriously affecting their coking properties. An example of this is seen in the very large difference existing in the volumes of carbon, etc., in two of the best known coking coals. Connellsville coal contains 59.79 per cent. of fixed carbon, while Pocahontas has only 72.7 per cent carbon. The ash, sulphur, and phosphorus are neutral, exerting practically no influence in coking the coal. They are simply undesirable elements in the coke.

The belief that all the free sulphur in coal passes off with the volatile matter in the process of coking, is not borne out by recent experiments. It was shown that the percentage of free sulphur expelled by coking varies considerably; the maximum amount out of 25 tests was 58 per cent., and the mimimum 15 per cent. It is important to remember, therefore, that if careful handling and washing will not remove the excess of sulphur, it must not be expected that this result will be accomplished by the usual coke-oven methods. This consideration is important to bear in mind when selecting coals for the manufacture of coke for use in the blast furnace or foundry.

In anthracite breakers, after the coal has been screened and picked and gone to the storage bins, preparatory to being loaded into railroad cars for shipment; it is advisable to have the coal run from these bins over screens before entering the chute leading to the cars. This is found desirable because of the breakage that takes place when the coal is handled, and finally dumped into the bins. The coal which goes through these last screens is carried to a boot by a flight or pan conveyor, and is there elevated by buckets to the screens and pickers, where it is again sized. The installaton of a refinement of this sort provides for a better and more satisfactory size of coal for the consumer.

Metallics.

Magnesium may be obtained in several forms, the best known being magnesium ribbon, magnesium powder and magnesium sticks, of about 0.5-in. diameter.

Tin ores have not proved amenable to wet treatment for the extraction of tin, either with or without the application of electricity. The mineral cassiterite is very insoluble. However, the separation of tin from old tin-plated scrap-iron has been reduced to a satisfactory commercial operation.

Blow-holes exist in steel, but not in wrought iron. However, blow-holes, at least blow-holes which do not weld up and thus cease to exist, are not necessary. They can be prevented by the exercise of proper care and skill in the manufacture. The moral, consequently, is to buy steel only from careful and trustworthy makers.

The best metals for alloying with copper to reduce its oxide for the purpose of obtaining a sound casting, arranged in their order of excellence, are magnesium, calcium, aluminum, strontium and barium. Certain other metals, such as manganese, zinc and iron, have been used for this purpose; but the first mentioned are the best.

Copper is the most difficult metal to cast soundly in sand, and the principal reason for this is that copper oxidizes rapidly when melted, and the oxide is dissolved by the melted copper as soon as it is formed. Copper containing oxide presents no visible difference to pure copper, but when melted it runs slowly, and forms a porous casting.

Malleable metals are also ductile, but they do not possess the two properties in the same order. Arranged according to their malleability, the more important metals follow in this order: Gold, silver, copper, tin, platinum, lead, zinc, iron, nickel. The order of ductility on the other hand is: Gold, silver, platinum, iron, nickel, copper, zinc, tin, lead.

Tin ores rich in tungsten, or slags in which that metal has been concentrated, and which still retain a fair proportion of tin, are roasted with soda, whereby sodium tungstate is formed; this compound can be extracted with water and the tungsten thus removed from the tin. Wolframite and cassiterite are also economically separated by electromagnetic process.

The city architect of Toronto, Ont., after thorough tests of sand-lime bricks, has decided to allow their use for building in the city, which was formerly prohibited. The tests were conducted at the School of Technical Science, and resulted very favorably to the bricks, which stood a pressure of 225 tons per sq. ft. as against 60 tons borne by the ordinary brick.

On solidifying from the liquid to the solid state, a metal may either pass suddenly from one condition to the other, or it may go through an intermediate pasty stage. This fact is sometimes of great metallurgical importance. Thus, white pig iron is more suitable for dry puddling than is gray pig iron, as the former becomes pasty while the latter does not.

The smelting of a tin ore, purified in any of the standard methods, consists of a simple reduction with carbon and with the necessary fluxes, either in blast-furnaces or in reverberatories, the latter being now more commonly used. Smelting of tin ores in an electric furnace has not yet been reduced to a practical basis, although experiments have been directed toward this end.

Certain metals possess acoustic properties. The sound emitted by metals when struck is greatly affected by the presence of impurities. Thus in the case of lead, the presence of antimony tends to highten the sound emitted. Owing, it is supposed, to the sliding of crystal faces over one another, tin at ordinary temperatures, and zinc after heating to 160 deg., emit a sound when bent.

In an iron mine in Michigan the ladders are all set at an inclination, which makes climbing easier and safer. The poles of the ladders are made of 3x5-in. white oak. The rungs are made either of white oak or of iron, the former being 1.5 in. in diameter, the latter 0.75 in. The rungs wear out rapidly under the calked boots of the miners, and in many mines are allowed to remain too long for safety.

It has been supposed that the presence of copper is prejudicial to steel, but later investigation has shown that the deleterious effect observed arose probably from the presence of small quantities of sulphur, with which the copper was associated, and not from the copper itself. Recent investigators have shown that the presence of copper, up to 3 per cent. materially increases the tensile strength of steel.

Cadmium may be reduced and refined electrolytically in very much the same way as zinc, except that not so much care is required. The solution must be kept slightly acid and in brisk motion, in order to prevent the formation of spongy deposits. Under similar conditions, a lower current density can be used for precipitating cadmium than is required for forming a dense deposit of zinc. Satisfactory results have been obtained with current densities of 50 to 100 amperes per sq. meter.

When the drum of a hoisting engine has to be made in sections jointed together by flanges, these flanges should be made in the form of separate short lugs, the cross section of the drum being reduced for some distance circumferentially on each side of the joint, giving greater flexibility at these points, to compensate for the rigidity of the lugs, the necessary cross-sectional area to sustain the compressive stress being obtained by thickening up the metal immediately under the lugs.

There is no doubt whatever that galvanizing has an injurious effect on steel wire, and, consequently, on wire ropes, the effect being greater as the quality of the steel improves, and as its tensile strength increases. The deterioration is not due merely to the effect of the zinc on the steel, but also to the effect of the muriatic acid used for cleaning the steel preparatory to galvanizing; while, moreover, the heat of the galvanizing bath reduces the temper of the steel, which cannot be subsquently recovered by a further drawing after the wire has been galvanized.

Charcoal and various fluxes, such as borax, cryolite and fluorspar, together with certain reducing agents, such as cyanide, have been used in melting copper, to obtain a good casting, but such fluxes cannot be relied upon to accomplish the results. The best copper castings are obtained by mixing small quantities of certain metals with the copper, by which the oxide is reduced. The only objection to this is that the conductivity of the copper—and it is mainly for electrical purposes that copper castings are required—is reduced by the admixture of other metals.

Steel always, and almost necessarily, contains more manganese than wrought iron. It has been suggested that this may be the explanation of the more rapid rusting of steel, which is commonly alleged to be a fact. The observations upon which this allegation are made are possibly imperfect. Careful tests do not show that steel rusts materially faster than wrought iron. However, it may be that the conditions of the tests have not accurately duplicated those of practice. Steels, which in the first few months may rust faster than wrought iron, may, on greatly prolonging the experiment, or pushing them to destruction, actually rust more slowly, and *vice versa*.

For the purpose of alloying with copper, magnesium in sticks is the only form applicable, but a more convenint way is to make a rich alloy of copper and magnesium, and then to add the necessary amount of this alloy. To make an alloy of copper and magnesium, melt 45 lb. of Lake copper under a good layer of charcoal, so that it will not oxidize any more than is necessary, and then introduce 5 lb. of stick magnesium, one stick at a time. The sticks have to be held under the copper, in order to insure proper mixing, since magnesium is extremely light. The melt should then be stirred with a graphite rod, and poured into small ingots. The amount of magnesium required to insure a sound copper casting is only about 0.1 per cent. It is therefore much easier to use a high alloy of the two metals rather than the pure magnesium.

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*Illustrated.

Transvaal Gold.

Transvaal gold production continues to break all records. The June output was $9,838,403, the largest ever reported for a single month. This brings the total for the first half of 1906 up to $54,909,173; which is a gain of $6,112,057, or 12.5 per cent., over the first half of 1905; and of $2,482,798, or 4.7 per cent., over the second half of last year. Should no unforeseen troubles arise, the Transvaal mines are now sure to produce a total of $110,000,000 in 1906; and an output of $115,000,000 for the year is quite possible.

The Government Fuel Tests.

The appropriation by Congress of $200,000, for continuing the fuel testing work at the station of the Geological Survey at St. Louis, will enable the managers of that plant to go ahead with their elaborate plans, the results of which they anticipate will be very important. The work done up to the present time has covered only a small number of the coals produced in the United States. The results obtained in connection with this investigation have already been of great value, and all branches of the mining, metallurgical and manufacturing industries will welcome the continuance of the work.

The New York Stock Tax.

The recent construction of the New York law respecting the tax on stock transactions, whereby 2c. per share is levied on each transaction, regardless of the par value or market price of the stock, has practically checked the business in low-priced mining stocks in the New York market. However, this is not a condition which is entirely to be deplored. The mining stock, which has a par value of $1 per share, and sells down to 2 or 3c. per share, or a few dollars per thousand shares, as we have known cases, is always an object of suspicion, and is designed for distribution among a class of people who buy them on much the same theory that they buy lottery tickets. The less of this kind of business there is, the better it is for the mining industry. However, the New York tax doubtless bears unfairly upon some legitimate enterprises.

Lake Iron Ore.

Iron-ore shipments from the Lake Superior district in June, though very large, did not reach the 6,000,000 tons expected and predicted. There was some congestion at the receiving ports on Lake Erie toward the close of the month which delayed the movement of vessels. The chief reason, however, why the shipments fell short of expectation was the difficulty in securing labor enough. This trouble was most manifest on the Mesabi where the working force is of a more unstable and shifting class than on the older ranges; though on the Marquette and the Menominee more men could have been employed if they could have been secured. On the Michigan ranges there is a large population settled and rooted in the country, having their homes and families there, who can always be relied on. On the Mesabi there is a less reliable class of men, a large proportion of whom are ready for change and can be attracted away by the desire for change to farm and railroad work; and there is a great demand for men throughout the Northwest this year.

The United States Steel Corporation.

The final figures prepared by the American Iron and Steel Association show that in 1905 the United States Steel Corporation made 43.8 per cent. of the pig-iron output of this country; 60.2 per cent. of the steel ingots; 47.3 per cent. of the rolled products, iron and steel. A comparison with 1904 shows that the corporation has not quite held its own, nearly all the percentages given showing slight decreases. Last year, of course, was one of active demand and production, so that almost all works in condition to run at all could be run at a profit. The figures show, however, that the outside capacity for production has grown a little faster than that of the Steel Corporation. The new work which is in hand will go some way toward changing the proportion; but its completion will require well on toward two years, at least.

The weakest side of the corporation is in pig-iron production, as it always has been. To a certain extent this is offset by its command of iron-ore supplies, through which it is able to make deals for the output of a number of outside furnaces, and thus control their iron. It is manifest, however, that its productive capacity needs strengthening in this direction.

San Francisco as a Junk Market.

When the clearing up of San Francisco begins, that city will doubtless be the largest junk market that this country has known. We have seen some huge estimates of the quantity of scrap iron, old copper and other metals that may be recovered from the ruins. These estimates are largely of the character of speculations, which lend occasional excitement to the otherwise unromantic business of the junk dealer. However, the quantity of old metals that will be obtained from San Francisco is undoubtedly very large. It is to be expected that at least an equivalent quantity, and we hope a much larger quantity, will eventually be returned to the city in the form of manufactured articles.

Incidentally, the small metal refining concerns, which buy their crude material from the junk men, will doubtless have many interesting metallurgical problems, such as the separation of mixtures of lead, tin and spelter, melted together in the conflagration. These refiners often have such problems, and devise ingenious solutions, accounts of which would be interesting to the metallurgists who are familiar only with the preparation of the metals from virgin material.

The Tariff on Zinc Ore.

The zinc-ore case has recently been argued before the Board of United States General Appraisers. This case originates from the attempt of the Joplin producers to stop the free importation of zinc ore by the Kansas smelters from British Columbia and Mexico, to which we have referred several times previously. As a result of their efforts, the Secretary of the Treasury, Feb. 10, 1906, instructed the collectors of customs to admit calamine (defined by him as silicate of zinc) free, and assess all other ores of zinc at the rate of 20 per cent. *ad valorem*. However, the smelters have continued to import ore, paying the duty, being confident that the Treasury order will be reversed by the courts and that the excess duties will be refunded. The present is a test case brought in pursuance of this policy. It will possibly be a long drawn out matter, inasmuch as if the decision of the appraisers be adverse, appeal will doubtless be taken to the courts.

The question is of great importance because of the magnitude already attained by the importations of foreign ore and their effect upon the domestic spelter market. The Joplin producers aim to restrict the ore-buying field of the smelters with a view toward enhancing the value of their own product. So far the effect of the Treasury order of Feb. 10, 1906, has been utterly disappointing in this respect, the price for ore at Joplin having gone down rather than up, and there appears to be something of a feeling of regret that the matter was ever raised. On the other hand, the smelters claim that they are obliged to go abroad in order to secure the necessary ore supply. One thing is certain, viz., if the ore producers had their wish of a higher price for ore, the price for spelter also would have to be higher and the consumers would have to foot the bill.

The case now before the board involves the definition of "calamine," as to which there ought not to be any question in view of its use, technically and commercially, for a century, to comprise all the silicates and carbonates of zinc; and the proper classification of blende ore under the Dingley tariff. Apparently the smelters intend to make their fight on the claim that in view of the lead content which such ore, almost without exception, possesses, it should come under the classification of paragraph 181 as "lead-bearing ores of all kinds" and pay duty at the rate of 1½c. per lb. on the lead content.

At the conclusion of the importers' arguments the case was adjourned to Sept. 6, at which time the Government and the mine owners will present their side of it. Pending this, it is proper to reserve further comment.

Coal Mining by Specialists.

The consideration of coal-mine managers has lately been directed to the advisability of requiring both the skilled and the unskilled laborers in the mines to perform certain special work, instead of diverting their attention and expending their energy on a number of different duties. This innovation is one that will lead to increased efficiency, safety, and economy, and has engaged the attention of the operators, not only because of the many accidents, resulting from an inefficient performance of important duties by incompetent miners, but also because under the old system of employment the miner is apt to be careless about the performance of certain precautionary measures, which afterward may result disastrously to himself, to his comrades, and to the operating company.

It is well known that no other workmen become so hardened to the proximity of danger as the miner, and in view of this tendency, it is clearly the duty of his superiors to regulate the work so that it will be impossible for anyone to endanger his own, and the lives of other workmen, in so far as this highly desirable result can be accomplished.

It is only a few years since it was the custom for miners to do their own timbering, undercut and shoot their own coal, push their cars to and from the face, and load the coal as well as attend to the brattices in their working place. Although this custom has not been universally abandoned, it has now become the general practice to arrange the work so that each duty is performed by a certain class of laborer, who is usually paid by the day. This arrangement allows the men to become expert in the performance of their special duties, and it is certain that there is less liability for them to neglect a careful performance of what they are expected to do. Bratticemen are common in most of our mines, and understand the ventilation arrangement better than the miner possibly could. Machine men now frequently attend to nothing but undercutting the coal, and guiding and repairing the machine. Lately, an arrangement has been adopted, whereby certain men only examine and timber the working places, and others do nothing but shoot the coal.

As a result of the adoption of this new system, there is an undoubted saving in the cost of production and a more efficient and safe working of the mines. The burden of a colliery engineer's life is to have miners turned loose in an entry or room, and tear the coal out in any direction irrespective of the pair of centers he has so carefully put in. No system of mining can be followed where this is done, and no mine can be successfully worked where a system is not followed. In keeping with the progress of the times, it will become the practice to have all the work in our mines performed by specialists, and the order of affairs where dishonesty, greed and favoritism sometimes permitted one miner to make $500 or more in a month from a snap contract, while other deserving workers could gain but a pittance, must soon become an incident of past history.

The Lungwitz Process—II.*

BY FRED W. GORDON.†

The following argument bearing upon the process of zinc reduction in a blast furnace may be presented against the reasoning advanced in my previous article (see the JOURNAL, April 28, 1906).

Careful tests have established the boiling pressure of zinc at 75 lb. gage, or 90 lb. absolute, at a temperature of 1350 deg. C; the vapor tension is 90 lb., and this is the molecular equilibrium at this temperature; hence the vapor of zinc will fill any actual gas, it is very nearly true for many."

Hence the temperature must be reduced or the pressure increased. The temperature must be reduced that the vapor tension may be lessened so that other gases may be admitted to bring the pressure back to 90 lb. Or, holding the temperature up to 1350 deg. C., air is forced in, raising the pressure.

The bleeder valve on the furnace controls the pressure. Any desired quantity of air may be used and the pressure not increased; we have then, however, produced a current which sweeps all liquid

THE BLAST FURNACE AT WARREN.

the space at 90 lb. and no air, carbon monoxide or nitrogen could be present without increasing the pressure (Kent, "Mechanical Engineers' Pocket-Book," p. 480).

"The pressure exerted against the interior of a vessel by a given quantity of a perfect gas, enclosed in it, is the sum of the pressures which any number of parts into which such quantity might be divided, would exert separately, if each were enclosed in a vessel of the same bulk alone, at the same temperature. Although this law is not exactly true for

zinc, whether in bath or particles, keeping attenuated the vapor covering of the liquid zinc and promoting volatilization.

Zinc when subjected to a temperature of 1350 deg. C. will fill all communicating space maintained at that temperature, and not otherwise occupied with solid materials, with a vapor weighing 0.366 lb. per cu.ft. and no more; and this quantity, or weight, of zinc vapor at 1350 deg. C. will exert a pressure of 90 lb. per sq.in.

If the temperature is maintained close to the boiling point and if the vapor, as formed, is swept away, vapor will then be given off rapidly. If air is injected and combustion effected, then there will be no such thing as a saturated vapor at the tuyeres. The vapor rapidly formed in that region will not liquefy at any such temperature when diluted with gases. The tendency to vaporization will extend to falling zinc globules. The cooling effect of this rapid work will be great.

The highly heated zinc vapor will pass up the furnace shaft, and if it condenses, it will leave much of its heat in the region where such condensation occurs. Zinc vapor, however, weighing 0.366 lb. per cu.ft. cannot be carried so freely by CO and N, which (at same temperature and pressure) weigh 0.09 to the same volume (being by this temperature and pressure not much changed in weight from weight at atmospheric pressure and temperature). Therefore if a current of 1000 cu.ft. per min. passes through an unoccupied (by solids) area of 7 sq.ft., the velocity would be $(1000 \div 7) \times (60 \div 5280) = 1.6$ miles per hour; i.e. "Between a wind hardly and just perceptible" (Kent). It would not carry much vapor weighing four times its own weight. Yet it displaces—it must displace the vapor. Both cannot occupy the same space without increasing the pressure, no more than could two solids.

Avogadro's law is "Equal volumes of all gases, under the same conditions of temperature and pressure, contain the same number of molecules." Oxygen at atmospheric pressure and 0 deg. C. weighs 0.0892 lb. per cu.ft.; therefore oxygen at 1350 deg. C. and 90 lb. pressure weighs, according to Boyle's and Bernouilli's laws $(90 \div 15) \times (273 \div 1623) \times 0.0892 = 0.09009$, and if this be multiplied by the molecular weight of zinc and divided by the molecular weight of oxygen, $0.09009 \times (65 \div 16) = 0.366$, or, the weight per cu.ft. zinc vapor at 90 lb. pressure and at 1350 deg. C.

The total weight of saturated gases at 90 lb. is 0.2353 lb. per cu.ft.,[1] but saturation depends upon the zinc vapor forming, or coming from below, with such rapidity as to keep up the required supply of vapor. However, in no case can more than this weight of zinc vapor exist in quiescent gases at that temperature and pressure. But these calculated proportions cannot be in the furnace because of the weight of the gases being insufficient to furnish the requisite heat. The gases are the total produced by combustion, and

*The first article under this title was published in the JOURNAL of April 28, 1906.

†Consulting engineer. New York City.

[1]Atmospheric pressure being taken as 15 lb., and absolute temperature of 0 deg. C. as 273 deg. C., the absolute temperature of 1350 deg. C. is 1623 deg. C. Then as the temperature is reduced to 1000 deg. C. while the pressure is maintained at 90 lb., we have the following calculations: At 1000 deg. C. by the test referred to above, the vapor pressure would be 26 lb., absolute. Weight of zinc vapor at this temperature and 26 lb. pressure would be $(26 \div 15) \times (273 \div 1273) \times 0.0892 \times (65 \div 16) = 0.1347$ lb. per cu. ft. Pressure of gases, 64 lb. Pressure of zinc vapor, 26 lb. Total pressure, 90 lb. Weight of gases at one atmosphere and at 0 deg. C. equals 0.0782 lb. per cu.ft. Then at 1273 deg. absolute and pressure of 90 lb., gases will weigh $0.0782 \times (273 \div 1273) \times (90 \div 15) = 0.1006$ lb. per cu.ft.

would furnish only one-sixteenth of the heat required, providing 0.1347 lb. represents all the zinc made, as calculated for the ore and slag mixtures used at Warren, N. H.

Proceeding as before, we have the following calculation:

At 920 deg. C. and 14.7 lb. pressure, (14.7 ÷ 14.7) × (273 ÷ 1193) × 0.0892 × (65 ÷ 16) = 0.083 lb. per cu.ft. zinc vapor. Pressure of gases, 75 lb.; pressure zinc vapor, 14.7 lb.; total pressure, 89.7 lb.

Weight of gases, 0.0782 × (273 ÷ 1193) × (90 ÷ 15) = 0.1074 lb. per cu.ft.

At 500 deg. C. and 1.5 lb. pressure (per tests referred to), (1.5 ÷ 15) × (273 ÷ 773) × 0.0892 × (65 ÷ 16) = 0.0128 lb. per cu.ft. zinc vapor.

Pressure of gases, 88.5 lb.; pressure zinc vapor, 1.5 lb.; total 90 lb.

Weight of gases, 0.0782 × (273 ÷ 773) × (90 ÷ 15) = 0.166 lb. per cu.ft.

0.166 ÷ 0.0128 is a little less than 13:1, which is not nearly enough.

It seems from these figures that the temperature of the liquid zinc must approach the temperature at which it will solidify, when it will cease to give off vapor in excess of that sufficient for saturation. In other words, before the temperature is reduced to that point saturation is not attained, and the zinc will not solidify, and the vapor may and *will* rise with the gases.

These statements seem to be directly contradictory. While the zone is hot, too much vapor is given off for saturation, or there is an excess of saturation, a thing to be desired, were it true.

The gases have been estimated in quiescent condition, a condition which would be attained at assumed temperatures and pressures, if sufficient time permitted, and if no effect should result from condition above or below.

Then at 920 deg. C., and 90 lb. pressure, the space would contain per cu.ft., 0.1074 lb. of gases and 0.083 lb. zinc vapor; the relative weight being 1.3 lb. gases to 1 lb. zinc vapor, and this is saturation. But it may be assumed that not less than 30:1 will be required for successful operation—certainly not by any possibility less than 15:1, when saturation is lost, liquefaction prevented and further gasification promoted.

Can the vapor accumulate? To answer this, the tuyere zone, whence the gases come, must be considered. To obtain sufficient heat, 12 lb. of gas must be formed to each pound of metallic zinc in the charge, and the temperature of the hearth must be maintained at 1350 deg. C. That zinc may not boil, a pressure of 90 lb. must prevail, this being exerted by CO plus N and zinc vapor. But the vapor at this temperature has a tension of 90 lb., or thereabouts, and the molecular equilibrium is established only when zinc vapor, and no gas, exists in the hearth. If then combustion is to be rapid and effective, only a small percentage of the required vapor of saturation is permissible. If this process of vaporization is rapid, or fairly so, and we can assume it will be (the temperature being near the boiling point), then will all zinc vapor, which might otherwise be in the hearth, be promptly caried up; or in other words, no zinc vapor can stay in the hearth—no accumulation can take place.

Higher up in the furnace, where rapidity of vaporization has decreased, due to reduction of temperature, some zinc may be met by the gases, and some vapor will rise with them, and yet more, as they rise higher and meet cooler regions, because vapor *must* be carried up with the gases if vapor cannot accumulate below.

The zone heated to 1000 deg. C. is reached. If that were a saturated zone, then each cubic foot of space would contain 0.1347 lb. zinc, and only 0.1006 lb. of gases. Assuming that the zinc vapor reached this zone, can it be conceived that the vapor would remain; or the equivalent of remaining there, while the gases are exchanged some 20 or 30 times? The mechanical friction, if not cohesion and diffusion, would preclude such a conception. If the molecular motion (heat) existing in all molecules is considered, the air molecules could not separate out from those of zinc without carrying along a large percentage of them. It is not tenable to pass a current of gas through a mass of vapor; both must move practically together. It is hoping too much to assume that any large portion of the zinc will remain behind. Some little might be left behind, let it be granted, but scarcely enough to be of practical value.

This assumed saturated zone, at 1000 deg. C., is not possible in a working furnace, because there is present only one-twentieth of the weight of the gas necessary. This zone, like that of the tuyeres, is hungry for zinc vapor and no falling zinc globules can pass through it.

The temperature at which volatilization of zinc will give a tension of zinc vapor low enough to mix with a sufficient weight of gas to furnish the requisite furnace heat, is possibly 450 deg. C., after which liquefaction will soon cease and snow be formed; so that all the heat of vaporization must be taken up by the stock after it has been cooled to 450 deg. C., an assumption difficult to entertain.

If all the zinc being produced by the combustion of 1 lb. of coke to 0.5 lb. of zinc were as vapor at the 500 deg. C. zone, then saturation would about be attained; below this zone the space for the existing temperature is short of zinc vapor.

If zinc above the 500 deg. C. zone, as a globule, drops through that gas, it will volatilize sooner or later, because the conditions favorable to volatilization improve on the way down, till all the tuyeres no vapor exists except that locally being formed; i.e. if we assume zinc to be in the hearth and rapidly rising, all the space being taken up with the 90 lb. of gas, no liquid zinc can reach the hearth.

The force of the argument set forth above rests upon the assumption that zinc, liquid under pressures too high to permit actual ebullition, nevertheless vaporizes with great rapidity. That this position is untenable, in the sense that the rapidity of such vaporization is not sufficient to defeat, or to seriously interfere with, the successful working of the Lungwitz furnace, seems to be shown by the following reasons: (1) From the theory of vaporization below ebullition conditions, the molecular velocity has a controlling influence. (2) Cohesion between liquid molecules assists in restraining vaporization. (3) The length of time the liquid zinc is exposed to vaporizing influences, after its formation and until it passes into a bath protected by slag and lead-zinc alloy, does not exceed four seconds; during this time it must either be reheated (against loss of heat due to vaporization) from a temperature of 500 deg. C. to 550 deg. C., or this very low temperature will preclude the possibility of anything but inconsiderable conversion into vapor.

The mean velocity of the molecules of the so-called permanent gases varies as the square root of the density of the gas, or to the atomic weight of the elementary gases. For instance, as deduced by Clausius:

Air—Density 14.45—Velocity of molecules 485 m. per sec.

Oxygen—Density 16—Velocity of molecules 461 m. per sec.

Nitrogen—Density 14—Velocity of molecules 492 m. per sec.

Hydrogen—Density 1—Velocity of molecules 1844 m. per sec.

Zinc—Density 65.4—Velocity of molecules 228 m. per sec.

$\sqrt{14.45} = 3.8$; and $1844 \div 3.8 =$ 485 as above.

$\sqrt{16} = 4$; and $1844 \div 4 =$ 461 as above.

$\sqrt{14} = 3.7417$; and $1844 \div 3.7417 =$ 492 as above.

$\sqrt{65.4} = 8.09$; and $1844 \div 8.09 =$ 228 as above.

The simple formula from which these mean velocities were calculated is $P = \frac{1}{3} d G^2$, in which P represents pressure and d represents density. This is correct only when the gases act in agreement with Boyle's law, which the above four gases, viz., air, oxygen, nitrogen, and hydrogen do, very nearly; but zinc vapor may and no doubt does depart very much by a reduction in velocity, and cannot by any theory have a higher velocity than that given above.

The variations from Boyle's law are:[1] "If the dimensions of the molecules are not infinitely small, the calculation which led to the law is not exact." The specific gravity of a zinc molecule may or may not exceed that of the molecules of above gases, but if it is equal, the linear dimensions are double those of oxygen, or $\sqrt[3]{8} = 2$; while they are four times that of hydrogen, or $\sqrt[3]{65.4}$.

Inasmuch as all gases have the same number of molecules per unit of volume when under the same temperature and pressure conditions, this most probable increase in molecular dimension of zinc re-

[1] See Myer's "Kinetic Theory of Gases."

duces the free path and increases the frequency of collision; the pressure must therefore increase at a greater rate than the volume diminishes (a diminishing distance between the molecules); hence increasing cohesion and still further reducing volume. It is further noted that vapors depart from Boyle's law more widely than gases, higher temperatures being required for the same molecular velocity to maintain the volume; or for the same volume, a greater number of molecules, requiring less velocity for the heat and temperature. By pressure or compression, the cohesive force is assisted in retaining molecules or from forming vapor.

This cohesive energy of zinc molecules may be appreciated by noting the considerable increase of temperature required for zinc ebullition over that calculated. In the tests referred to, made to determine the pressure by indifferent gases necessary to restrain ebullition at various temperatures, seven atmospheres, or 102.9 lb. absolute, was sufficient to restrain ebullition at a temperature of 1460 deg. C.; 39.7 lb. absolute at 1080 deg C.; and one atmosphere at 920 deg. C.

Ramsey and Young have shown (Travers, "Study on Gases," p. 235) that the vapor pressures of any liquid may be calculated for any temperature, when the vapor pressures corresponding to two temperatures are known.

Let Ta and Tb be the temperatures corresponding to the vapor pressure P for two liquids, and Ta′ and Tb′ the temperatures corresponding to the vapor pressure P′ for the same two liquids.

Thus (Ta ÷ Tb) = (Ta′ ÷ Tb′) + K (Ta — Ta′) when K is some constant.

Putting Ta = water at 14.7 lb. pressure and temperature 373° C. absolute.
Tb = zinc at 14.7 lb. pressure and temperature 1193° C. absolute.
Ta′ = water at 39.7 lb. pressure and temperature 403.3° C. absolute.
Tb′ = zinc at 39.7 lb. pressure and temperature 1353° C. absolute.
And Ta″= water at 102.9 lb. pressnre and tem perature 438.3° C. absolute.
Then Tb″= zinc at 102.9 lb. pressure and tem perature 1562° C. absolute or 1289° C.

Notwithstanding the above calculation, it was shown by the tests made at Warren, N. H., that zinc ebullition ceased at 1460 deg. C. when the applied pressure of CO and nitrogen equaled 102.9 lb.; hence the difference between 1289 deg. C. and 1460 deg. C. =171 deg. C., or 11.7 per cent., is only explained by the greater cohesive force of the zinc molecules over that of water molecules; and yet Clausius demonstrated that water vapor tension, between zero and 100 deg. C., varied from Boyle's law by 5 per cent. Granting the correctness of Ramsey and Young's formula for permanent gases (and there is no higher authority) the only reason given by the authorities for this great departure of zinc from the law governing permanent gases is the superior cohesive power of zinc in its liquid condition, and during the act of volatilizing.

The tests made at Warren are certainly to be relied upon; of this there is no shadow of a doubt in the mind of anyone who participated in them; and as about 300 of them were made, which closely verified each other, the error, if any, is put beyond one of observation. They showed that a higher temperature was required for ebullition (the 171 deg. C. mentioned above) than calculation would lead us to expect, and this is consistent with the known character and behavior of this liquid and vapor.

Myer says ("Kinetic Theory of Gases," p. 96): "For the state of equilibrium of a saturated vapor, which lies above its liquid, is characterized by this, that the equilibrium is maintained by vaporization and condensation at the surface of the liquid. The molecules of the vapor, which in their to and fro motion strike the liquid surface, will not all bounce back, but a part will be retained by the force of cohesion." This, at once, leads inevitably to the conclusion that zinc vaporization proceeds slowly, below the ebullition temperature, because we have to consider slow mean molecular velocity and strong cohesive force.

The test made at Warren to determine the pressures restraining zinc ebullition at various temperatures consisted in placing a small quantity of metallic zinc in a strong iron bomb of liberal dimensions, filling the bomb with crushed coke, passing air pressure through coke to the metal, and said air pressure being under control from zero gage pressure to 120 lb. per sq. in. The bomb was heated to 1400 deg. C. while under 120 lb. pressure, at which time the coke was highly incandescent, and only CO and nitrogen could reach the zinc. A permanent outlet, 0.01 in. diameter, through the red-hot shell of the bomb, permitted an escape of whatever gas was just above the liquid zinc. The couple of the pyrometer was inserted well into the bomb, in a separate non-communicating chamber, though in proximity to the zinc. The pressure was gradually lowered until the characteristic zinc flame appeared at the small outlet. The pressure was raised until the flame ceased; 0.5 lb. increase of pressure, at the critical point, being sufficient to stop ebullition of zinc. Although liquid zinc was then at the point of boiling, no vestige of zinc appeared at the outlet when under ebullition temperature and corresponding pressures. This is mentioned as a further proof of the very slow waste of liquid zinc by volatilization under the boiling point.

It is shown how slight is the rate of volatilization when conditions of temperature and pressure are near the critical point. If the pressure were maintaned and the temperature lowered, this rate would decrease as the square root of the absolute temperature, because this rate may be considered as varying directly as the speed of the molecules. Hence, however slow at or near the boiling point, it rapidly becomes slower as the temperature falls.

The Lungwitz furnace shaft has practically the same pressure throughout; an iron blast furnace with free escape of gas from the trunnel head, may have a hearth pressure of 20 lb. per sq.in., this compression resulting from the resistance of the high and compact column of stock to the passage of the gases. In the Lungwitz furnace, with only one-third the hight, or about that of old time charcoal-iron furnaces, the stock would present no more resistance than they did, or say 2 to 3 lb. per sq.in., if the gases were not further compressed; but when compressed to one-quarter their volume, the upward motion of the gases, reduced to one-quarter their velocity, would meet with only a nominal resistance from the stock. It may therefore be assumed that this furnace, when working under a blast pressure of from 50 to 90 lb. gage, would have the same pressure throughout.

Assuming that the zinc vapor is not condensible in the atmosphere met with at the temperature of reduction, but that its vapor rises and reaches a cooler zone and better saturated atmosphere (as previously explained) in which some of it will liquefy, and that the remainder of the vapor will form fume and adhere to the cooler stock, which descending with the stock, will melt, forming globules in a well, if indeed not completely satisfied atmosphere, these globules, from either source, will, at once, commence a rapid descent at temperatures not much exceeding 500 deg. C., which under a compression of say 50 to 90 lb. gage pressure of somewhat under-saturated gas, would give off vapor at a very slow rate. But becoming heated as they, in their descent, meet hotter gases, they will vaporize more rapidly; but by the very act of volatilization they will be cooled, resisting an increase of temperature. The time occupied in percolating through about 20 ft. of stock from the zone of 500 deg. C. temperature to the slag basin of the hearth, cannot much exceed four seconds. It appears that very litle waste, in weight, is to be expected from this zinc rain. The zinc having passed through the slag, with the lead (lead ore or lead, segregated out from the product, is charged with the zinc ore) an alloy is formed much more difficult to vaporize than pure liquid zinc. The liquid zinc or zinc-lead alloy, in the hearth, is protected by the slag above it, and the entire mass being decidedly cooler than the zone of combustion, it will be retained with insignificant loss, between tappings. Provisions are made, however, that this tapping may be practically continuous.

Exports of Naxos emery from the port of Syra show but little variation. The amount in 1905 was 6337 metric tons, while in 1904 there were 6353 tons exported.

Correspondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by artcles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Mexican Chamber of Mines.

Sir—The communication in your issue of June 23 regarding the Mexican Chamber of Mines, signed "T. A. C.," is, it seems to me, a totally mistaken and harmful exposition of the purpose and organization of the Chamber of Mines, organized in Mexico on May 15. Inasmuch as I was a member of the Guanajuato delegation therein referred to and was present at not only the meeting of organization but at the preliminary meetings, at which both Mr. del Rio and Mr. Riquena were asked to offer their names as candidates for the two principal offices, no apology seems necessary for this reply.

This movement was started in Guanajuato by a few representative mining men of that district something over a year and a half ago, communications being sent out to practically the entire Republic, and from this grew the meeting held a year ago, at which nothing very definite was accomplished, except to find that there was a strong feeling that such a chamber was desirable and necessary. The meeting at that time was held, as was the one of May 15, in the offices of Lic. Pablo Martinez del Rio, who took a very active and efficient interest in giving the matter form. At that meeting Don Luis Riquena, president of the Dos Estrellas Mining Company, who had been very active in all mining matters in the Republic, was elected secretary, and during the past year was extremely energetic in fomenting the matter, and to his efforts, in a large degree, the existence of such a chamber is due.

As a preliminary to the meeting of May 15 last, a caucus was held of all the mining interests in Guanajuato, embracing without exception, those who had been concerned in the original movement, which started here. It was decided at this meeting that, while it was recognized that both Mr. del Rio and Mr. Riquena occupied official positions, respectively, with the Mexican Dynamite Company and the MacArthur-Forrest company, no persons better qualified, both by prestige with the Mexican Government and ability, and, in the case of Mr. Riquena, in recognition of the most earnest and disinterested efforts which he had made during a year's time to put the thing on a firm basis, could be found. It was decided then that these would be the candidates of the Guanajuato delegation.

This delegation went to Mexico City somewhat ahead of the date set for the meeting and waited upon both Mr. del Rio and Mr. Riquena to secure their acceptance of the nomination by such delegation. In both cases the gentlemen were unwilling to serve, Mr. del Rio advancing the very point made by "T. A. C.," that his connection with the dynamite company might be made a cause of difficulty and that a proposed prolonged absence from the Republic would make it impossible for him to give efficient service. The objections of the gentlemen were finally overcome, however, and their names were accordingly presented as nominees by Lic. Carlos Robles of the Guanajuato delegation. Before any approaches were made either to Mr. del Rio or Mr. Riquena, the members of the Guanajuato delegation took occasion to talk with the utmost frankness with as wide a circle of mining men as possible in Mexico upon the wisdom of the selection without, in any single instance, to my knowledge, meeting any divergence from their own opinion that the two gentlemen were the most suitable for the positions who could be found, and they were elected without a dissenting voice.

While Mr. del Rio's position has been that of president of the so-called dynamite monopoly for some time the position has been a nominal rather than an active one, he having been chosen as a compromise candidate for that office between two rival factions, and the fact that he is the representative in Mexico of more American corporations of strength than any other two men in Mexico was a powerful factor in his selection for candidate as president of the Mining Congress.

As to Mr Riquena's connection with the cyanide company, the writer, representing the Guanajuato Reduction and Mines Company, whose recent difficulties with the MacArthur-Forrest Company have been widely advertised, should be in a position to object, if any.

The experience at the meeting of a year ago, in which proceedings were rendered utterly futile by the admission of a number of incendiary and semi-socialistic tirades demanding the alteration of everything in sight, from Government laws to the abrogation of private contracts with the so called smelter trust, etc., was such that it was decided, before any meeting was held on May 15 last, that the purpose of such meeting should be confined absolutely to the organization of a fixed center, in the form of an executive committee to which, before presentation to the mining congress, all papers, of whatever nature, offered should be submitted in order to effect a selection of papers which had value, and an elimination of personal and private grievances such as had constituted such a large proportion of the proceedings of the first meeting. It was with this view and with the entire consent of an immense majority of those present that no papers were read or asked for at the organization meeting, it being deemed desirable to hold, within a few months, another meeting, which it was hoped would be even better attended, to which such papers as possessed value might be presented.

It is entirely untrue that the gentlemen cited as members of the Guanajuato delegation withdrew their sanction to the deliberations held or that there was the faintest feeling, either on the part of that delegation or with any of their friends with whom conversation was held, or that there was the slightest "hostile trend" to general mining interests.

The whole trend of the article by "T. A. C." is, in the opinion of my acquaintances who attended the meeting, entirely incorrect and mischievous toward what is a very necessary and valuable movement carried out in the best of faith and with great efficiency. C. W. VAN LAW.

Guanajuato, Mexico, June 29, 1906.

New Publications.

"Mineral and Allied Resources of Albany County, Wyo., and Vicinity." Compiled by H. C. Beeler, State Geologist. Pp. 79; illustrated. 6x9 in.; paper. Laramie, Wyo., 1906.

"Metallgiesserei. Hilfsmittel, Arbeitsverfahren, Erzeugnisse und Kalkulationsregeln." By Erhard Stahl. Pp. 170; illustrated. 6x8½ in.; paper, 5 marks. Freiberg, 1906: Craz & Gerlach.

"Die wirtschaftliche Entwicklung der Gelsenkirchener Bergwerks-Aktiengesellschaft von 1873 bis 1904." By Bruno Simmersbach. Pp. 96, 6x8½ in.; paper, 2.50 marks. Freiberg, 1906: Craz & Gerlach.

"The Mining Manual for 1906." By Walter R. Skinner. Pp. 1506. 5½x8½ in.; cloth, $8.40. London, 1906: Walter R. Skinner.

This is the latest volume of the well known and highly valuable handbook with which all mining men are familiar.

"Il Giacimento Solfifero della Louisiana (Stati Uniti d'America)." By Ing. L. Baldacci. Pp. 42 and 9 plates; illustrated. 7½x10 in.; paper. Rome, 1906: Tipografia nazionale di G. Bertero E. C.

This is an exhaustive and valuable account of the sulphur deposits of Louisiana, the method of their exploitation by the Frasch process, and the commercial conditions attendant upon the industry.

"Transactions of the American Institute of Mining Engineers, Vol. XXXVI." Pp. 873; illustrated. 6x9 in.; half leather. New York, 1906: American Institute of Mining Engineers.

Contents: Labor-saving appliances in the works-laboratory, by Edward Keller. The effect of impurities on the electrical conductivity of copper, by Lawrence Addicks. The occurrence of stibnite at Steamboat Springs, Nevada, by Waldemar Lindgren. Features of the occurrence of ore at Red mountain, Ouray county, Colo., by T. E. Schwartz. Origin of orbicular and

concretionary structure, by William P. Blake. Gas-producer power plants, by S. S. Wyer. The testing of gas producers, by S. S. Wyer. Bibliography of gas producers, by S. S. Wyer. An automatic stock-line recorder for iron blast furnaces, by J. E. Johnson, Jr. Improved method of slag treatment at Argo, by Harold V. Pearce. A summary of Lake Superior geology, with special reference to recent studies of the iron-bearing series, by C. K. Leith. The occurrence of pebbles, concretions and conglomerate in metalliferous veins, by Edward Halse. The copper deposits at San Jose, Tamaulipas, Mexico, by J. F. Kemp. The manufacture and characteristics of wrought iron, by James P. Roe. Repairing partly collapsed cylindrical furnaces, by John P. Cosgro. A special form of slag car, by L. W. Jones and B. H. Bennetts. Tin mining and smelting at Santa Barbara, Guanajuato, Mexico, by A. H. Bromly. Cyaniding silver-gold ores of the Palmarejo mine, Chihuahua, Mexico, by T. H. Oxnam. Biographical notices of Thomas M. Drown, M. D., LL. D., and Bruno Kerl, by R. W. Raymond. Biographical notice of Benjamin West Frazier, Jr., by Edward H. Williams, Jr. The application of dry-air blast to the manufacture of iron, supplementary data, by James Gayley. The classification of coals, by Marius R. Campbell. The commercial value of coal-mine sampling, by Marius R. Campbell. A machine for drawing coke from beehive ovens, by G. T. Wickes. The use of high percentages of fine ore in a charcoal blast furnace, by Harry R. Hall. The magmatic origin of vein-forming waters in southeastern Alaska, by Arthur C. Spencer. Genetic relations of the western Nevada ores, by J. E. Spurr. Kernel roasting, by Herman Poole. Biographical notice of Sir Lowthian Bell, Baronet, by Henry M. Howe. Recent problems in the training of mining engineers, by Samuel B. Christy. Notes on the physical action of the blast furnace, by J. E. Johnson, Jr. The outlook for coal mining in Alaska, by Alfred H. Brooks. Geological mine maps and sections, by D. W. Brunton. Genesis of the ore deposits at Bingham, Utah, by J. M. Boutwell. The origin of vein-filled openings in southeastern Alaska, by Arthur C. Spencer. The origin of Clinton red fossil ore in Lookout mountain, Alabama, by William M. Bowron. The electrolytic assay of lead and copper, by George A. Guess. Anthracite washeries, by George W. Harris. The limestone-granite contact deposits of Washington camp, Arizona, by W. O. Crosby. Are the quartz veins of Silver Peak, Nevada, the result of magmatic segregation? by J. B. Hastings. The importance of fine grinding in the cyanide treatment of gold and silver ores, by Frederick C. Brown. The manufacture of coke in northern China, by Yang Tsang Woo. The constitution of mattes produced in copper smelting, by Allan Gibb and R. C. Philp. Lead and zinc deposits of the Virginia-Tennessee region, by Thomas L. Watson.

Some Iron and Steel Statistics.

The annual report of the American Iron and Steel Association, which will shortly be issued, gives a few statistics of production which have not already been published. First among these is the careful and complete division of pig-iron production which the association has made in recent years, and which is as follows for two years:

	1904.	1905.	Changes.
Bessemer	8 907,713	12,220,209	I. 3,312,496
Low phosphorus.	190,946	186,907	D. 4,039
Basic	2,483,104	4,105,179	I. 1,622,075
Forge pig	550,836	727,817	I. 176,981
Foundry	3,827,229	4,755,288	I. 928,059
Malleable bess	263,529	635,236	I. 371,707
White, etc	53,284	67,768	I. 14,484
Total pig	16,276,641	22,698,404	I. 6,421,763
Spiegeleisen	162,370	227,797	I. 65,427
Ferromanganese	58,022	66,179	I. 8,157
Totals	16,497,033	22,992,380	I. 6,495,347

Bessemer pig includes iron running from 0.04 to 0.10 per cent. phosphorus; low phosphorus pig is below 0.04 per cent. phosphorus. The basic iron is all made with coke or coal, and does not include a small quantity made with charcoal as fuel. Foundry iron includes high silicon grades, like Southern soft.

The production of most of the more important finished lines has already been published. A feature of the report is the separate statement for the first time of the production of merchant bars, skelp, splice bars, hoops, bands, cotton ties and other miscellaneous forms of finished rolled iron and steel; also the production of rolled forging blooms and forging billets. The last item in the table below includes spike rods, chain rods, horseshoe bars, strips, shovel blanks, blanks for seamless tubes, railroad ties and all other finished rolled forms not enumerated in the preceding items. The figures are in long tons:

Products.	1905. Iron.	Steel.	Total.
Rails	318	3,375,611	3 375,929
Structural shapes	11,630	1,648,889	1,660,519
Plates and sheets	72,156	3,460 074	3 532,230
Nail plate	24.059	40,483	64 542
Wire rods	1,281	1,807,407	1,808,688
Rolled blooms and billets	405	41,349	41,754
Merchant bars	1,322,439	2,271,162	3 593 601
Skelp	452,797	983 198	1.435,995
Splice bars	17 422	179,900	197,322
Hoops, bands and ties	2,863	442,664	445.527
Miscellaneous	154,620	529,288	683,908
Totals	2 059,990	14,780,025	16,840,015
Totals, 1904	1 760,084	10,253,297	12,013,381

This shows an increase of 299,906 tons, or 17 per cent., in rolled iron, and of 4,526,728 tons, or 44.2 per cent., in rolled steel; the total gain being 4,826,634 tons, or 40.2 per cent. Of the total rolled products in 1905 there was 12.2 per cent. made of wrought iron and 87.8 of steel; against 14.7 and 85.3 per cent., respectively, in 1904.

In 1905 for the first time a separation was made of plates and sheets; plates including all of the No. 12 gage and thicker, and sheets all of No. 13 gage and thinner. The production was, in long tons:

	Iron.	Steel.	Total.
Plates	10,022	2,031,184	2 041 206
Sheets	62.134	1.428 890	1,491 024
Total	72 156	3 460 074	3,532,230

These figures include black sheets, for tinning; but they do not include nail plate, which is given separately.

Mineral Lands in Quebec.

In view of the interest taken at present in prospecting in northern Quebec, the following official summary of the mineral law will be of interest:

Mines belong to the Crown on all lots not patented previous to July 24, 1880, and the superficial owners have no right thereto unless they have been specially sold to them.

The department grants prospecting licenses at the following rates: On unsurveyed lands, $5 per square mile; on surveyed lands belonging entirely to the Crown, $5 per lot of 100 acres; on surveyed lands the surface whereof is sold, $2 per lot of 100 acres. Such licenses convey the right to lease or purchase the mines that may be on the land. They are valid for three months and renewable at the Minister's discretion.

When a mine is discovered on land belonging to the Crown, a lease or mining license for it may be obtained on payment of a fee of $5 and an annual rental of $1 per acre. The application must contain an accurate description as possible and the mine must be staked out on the ground by posts. The Minister may require a survey to be made if necessary. An area not exceeding 200 acres can be granted to one person. Such licenses are valid for a year; they give the right to mine and are renewable, provided the fee and rent be paid previous to their expiry.

Mining lands may be sold at prices varying from $2 to $10 per acre according to the kind of mineral and proximity to a railway, in lots of 100 acres only. Applications are valid only when made to the Department of Mines at Quebec and are not taken into consideration, unless accompanied by the required sums.

Holders of prospecting licenses are requested to make a *bona fide* prospect of their territory and to report to the department, in order to obtain a renewal. Every license or lease for which a new fee is not paid on its expiration reverts to the public domain.

The British Minister at Christiania reports that in consequence of a recent agitation a bill has been passed forbidding the sale of waterfalls to foreigners, who in future will only be allowed to lease them. A more complete bill is said to be in contemplation, under which any lease of a waterfall will be rendered illegal unless half the capital of the company is Norwegian.

Structural Materials in San Francisco.

BY CHARLES G. YALE.

Last year the structural materials mined or quarried in the State of California were valued at $7,274,846, an increase of $366,000 over the previous year. These include brick and pottery clays, portland cement, lime and limestone, macadam, magnesite, rubble and concrete rock, paving blocks, marble, granite, sandstone, serpentine, slate, glass-sand and sandstone. There is a yearly increase manifest in the output and value of these materials as cities and towns grow. The values given are spot and are largely increased at the points of consumption. Now that San Francisco is to be rebuilt, a sudden and great demand has sprung up for most of these substances, and prices have in many instances been materially advanced. Naturally much importation is going on, the local quarries being unable to meet the sudden requirements, the labor necessary being somewhat scarce. Nevertheless the conditions have led to a marked activity in many of these branches of business, which is likely to continue for several years. In this connection it may be stated that the Structural Association of Engineers has taken steps toward the establishment of a local experiment station for testing the fireproof qualities of various sorts of building material. It is likely that one of the most elaborately equipped stations of this kind will be organized soon.

In order that the experiment station should prove a fair arbiter of the merits of material it was urged that several engineers connected with the leading universities on the coast be engaged to conduct the experiments at the San Francisco station. This suggestion has met with universal approval, as such judges would be entirely unprejudiced in favor of any one building material.

United States Consul J. T. Hirsch, of Berlin, now in San Francisco, is of opinion that many structural materials from Germany may be used in this city during the present crisis. If not iron and steel, there are others that may be used. The first and most important thing to be done, Mr. Hirsch says, is to have samples of every sort of article that can be used in rebuilding the city placed where they can be inspected by everyone, and that the prices shall be marked upon each, so that everything shall be bought by sample at a fixed price. This may discourage speculations in architectural accessories, but the market conditions will be regulated so that builders and contractors will know what can be done. The materials embrace iron and steel, glass, cement, lead for paints, oils, etc. Mr. Hirsch has received some encouragement here and will return to Germany at once to see to the forwarding of the samples to be exhibited in San Francisco for commercial inspection.

Previous to the great fire the Board of Supervisors passed an ordinance requiring the use of fire-proof shingles in all new buildings within the fire limits, and also in repairing roofs within the district, where half of the roof had been destroyed. No attempt was made to enforce the measure when only temporary structures were put up, but in the permanent buildings it is generally believed that the owners will be obliged to comply with the law. Many of the smaller owners complain that if such action is taken it will work great hardship on them; but the manufacturers of slate roofing, which will be the material used, say they can furnish shingles at practically the same prices as are charged by the lumbermen. The slate men say that the slate roof saved the Ferry Building from destruction, when sparks and burning wood were blown on it, and that the work of the fire tugs would have been useless had it not been for the fireproof roof. Contractors say that there is now a great demand for fireproof shingles, and that when the rebuilding in the residence district commences the demand will be greater than the supply. At present slate quarries in El Dorado county furnish all the local supply but there are other quarries which will be opened should the demand warrant.

Questions and Answers.

The Miner's Inch.

What is the quantity of water in cubic feet corresponding to the miner's inch?

L. D. S.

Answer—The miner's inch, according to its best definition, corresponds for all practical purposes to a flow of 1.5 cu.ft. per minute.

Soon after the discovery of gold in California, the supply of water to the placer mines became an important consideration, in connection with which it was necessary to have a standard measure, not only accurate, but also so simple that the amount of discharge could be readily computed by anyone.

This was accomplished by the discharge of the stream of water through a rectangular, square-edged, vertical orifice, with free discharge into the air, and having a constant head. In different parts of the State the standard openings varied, the width ranging from 2 to 4 in., and the head above the top of the opening from 4 to 7 in. Each square inch of the opening was called "a miner's inch;" hence in a locality where the standard opening was 2 in. wide, if the miner wished a flow of 50 miner's inches, the orifice was 25 in. long, while if only 10 in. was needed, the length was reduced to 5 in.

The standard in use since 1852 or 1853 in the mining districts in Nevada county, Cal., was an opening 50 in. long, 2 in. wide, with constant head above the opening of 6 in.; the flow from this was called 100 miner's inches. When water was used for the whole 24 hours of the day, the flow was termed "a miner's 24-hour inch," and of course meant 2.4 times the amount of discharge of "a miner's 10-hour inch."

As larger amounts of water came into use, wider openings were adopted, one being 12 in. high, 12¾ in. long, with a constant head of 6 in. above the top of the opening.

According to the best authorities, the miner's inch is 1/200 part of the amount of water which will flow through an opening 12 in. high by 12¾ in. wide in a 1½-in. plank, under a constant head of 6 in. above the top of the discharge. This may be taken for all practical purposes as equivalent to 1.5 cu.ft. of water per minute, or, in other words, 1 cu.ft. of water per second is equivalent to 40 miner's inches. California and Montana have established this definition by State law. In Colorado, on the other hand, the State law provides that 1 cu.ft. of water per second is equivalent to 38.4 miner's inches.

Patents Relating to Mining and Metallurgy.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended June 16, 1906.

10,869 of 1905. NICKEL EXTRACTION.—R. W. E. MacIvor and M. Fradd, London. Extracting nickel as chloride from mattes and ores by digesting under pressure with chloride of magnesium.

15,119 of 1905. FLOTATION PROCESS.—A. P. S. Macquisten, Glasgow. Improvements in the inventor's flotation process for separating minerals, consisting of the addition of minute quantities of fatty acid to the water.

19,642 of 1905. COAL DRILL.—J. H. Foust, Milton, Pa., U. S. A. Improved form of bit for rotary coal drills.

22,630 of 1905. HANDLING TIN SCRAP.—J. Millivard and W. E. Tillson, Birmingham. Improved mechanical contrivances for handling large bulks of tin-plate scrap, so that the electrolytic recovery of the tin may be effected economically.

23,887 of 1905. BUCKET ELEVATOR.—W. H. Baxter, Leeds. Improved chain and belt elevators for crushed ores, the improvement being an adjustable bearing for the elevator which will keep the belt or chain tight in all circumstances.

24,002 of 1905. MODIFIED EXPLOSIVE.—H. Walker, Johannesburg, South Africa. For the purpose of purifying the air in a mine after blasting with dynamite, adding to the dynamite charge a stick of permanganate of potash, the detonation of the permanganate being assisted by the admixture of a small part of chlorate of potash and salammoniac.

26,362 of 1905. JIG.—W. Seltner, Schlan, Bohemia. An improved double-deck jig, especially intended for very close separation.

Published Week Ended June 23, 1906.

13,347 of 1905. ELECTROLYTIC WHITE LEAD.—R. Goldschmidt, Brussels, Belgium. A continuous process for electrolytically manufacturing white lead, the anodes being thick plates of lead and the cathodes thin plates of lead, and the electrolyte being a mixture of acetate and carbonate of soda.

15,050 of 1905. BLASTING CARTRIDGE.—Rheinisch Metallwaren and Maschinenfabrik, Düsseldorf. A blasting cartridge composed chiefly of amorphos picric acid, with cavities containing pulverulent picric acid and a detonator, the addition of the pulverulent matter being for the purpose of making the detonation more sure.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

James W. Neill was in Denver, Colo., last week.

Wilbur E. Sanders, of Helena, Mon., has been a visitor in New York.

E. W. Sebben returned to Denver a few days ago from a professional trip to New Mexico.

Mr. Adler, a mining engineer, who has had considerable experience in South Africa, is in Cobalt.

S. A. Josephi, of Denver, Colo., has returned there from Europe after an absence of six months.

Guilford Darby Scholl has taken a position with the Silver Lake Mining Company, at West Ossipee, New Hampshire.

Matt W. Alderson, of Helena, Mont., who has been spending several weeks in the East, returned to Montana this week.

E. L. White, of Boston, president of the Bingham Consolidated Company, of Utah, spent a few days in Butte recently.

Edwin E. Chase returned to Denver, Colo., from Mexico last week, and is at present on professional business at Ely, Nevada.

James Ross, president of the Dominion Coal Company, has returned to Montreal, after a long sojourn abroad, much improved in health.

G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, has returned to Fernie after spending a week at Victoria, B. C.

Joseph B. Tyrrell has secured a verdict in his favor in his suit against the Bonanza Creek Hydraulic Concession, Ltd., of Yukon Territory.

Max Heberlein, for years connected with metallurgical enterprises in Montana, visited Butte in the latter part of June, going there from Germany.

Charles H. Palmer, manager of the Boston end of the business of the Davis-Daly Estate Mining Company, is looking after company matters in Butte.

Frank Robbins, of Los Angeles, Cal., has been appointed to the charge of the property of the Midnight Sun Mining Company, on Solomon river, Alaska.

Olaf Sangstad has established an office as consulting and designing engineer in New York, making a specialty of temperature and pressure regulation.

J. P. Rogers, manager of the Conrad Consolidated mines, at Windy Arm, Yukon Territory, was in Seattle, Wash., lately, buying mining machinery.

Paul S. Couldrey, manager of Le Roi No. 2 mine at Rossland, British Columbia, is now also in charge of the Velvet-Portland mine, situated in the same district.

Fred C. Carstarphen, consulting engineer of the Hewitt-Carstarphen Company, Denver, Colo., is about to execute a government survey in Routt county, Colorado.

Herbert Haas is engaged by the Compania Metalurgica de Torreon, at Torreon, Mexico, in metallurgical engineering work. He left San Francisco, July 5, for Mexico.

R. G. McConnell, of the Geological Survey of Canada, left Vancouver, B. C., last month for Skagway, on his way to Dawson to take up the season's field work in Yukon Territory.

H. E. Winter, representative of a British syndicate, is visiting Canada, selecting sites for factories for the manufacture of "Ammonal," a new explosive for blasting purposes.

John W. Bell was in the Nicola district of British Columbia during June, examining mining properties in which R. P. Inglis, of Montreal, who accompanied him, is largely interested.

Albert I. Goodell, superintendent of Le Roi Mining Company's smelter at Northport, Washington, has returned from a visit to the East, which extended over five or six weeks.

James J. Hill, of the Great Northern Railroad, was in Toronto this week in a course of a tour of inspection over the Grand Trunk system, accompanied by some of the officials of the latter road.

Dr. L. D. Ricketts, general manager of the Old Dominion Copper Company, Globe, Arizona, is advising the Shannon Copper Company in connection with certain improvements at its milling plant.

Robert Angus has been appointed superintendent of the Iron Mountain mine, near Missoula, Montana. He was formerly in charge of the mine, but he has been at Republic, Wash., for several years.

Hon. W. B. Hoggatt, governor of the district of Alaska, is expected to during July pay a visit to Dawson, Yukon, where he will be the guest of Hon. W. W. B. McInnes, commissioner of Yukon Territory.

Arthur S. Dwight has resigned his position as manager for the Greene Consolidated Copper Company, and has returned to the United States. His address is temporarily at 99 John street, New York.

Wm. White has arrived at Moyie, East Kootenay, B. C., to succeed Geo. Clothier as superintendent of the St. Eugene mine on Moyie lake owned by the Consolidated Mining and Smelting Company of Canada.

Phil H. Foster, of New York, who is connected with the London Exploration Company, was in Butte July 1, but accompanied a party from there to the Yellowstone park. Mr. Foster lived in Butte a few years up to 1894.

A. A. Talmage, secretary and manager of the Blaisdell Company, of Los Angeles, Cal., severed his connection with said company on July 1, to become associated with the Securities Corporation, Ltd., at No. 40 Wall street, New York.

W. R. Ingalls and Philip Argall have completed their investigation of the zinc resources of British Columbia for the Canadian Government, and their report will shortly be published by the Mines Branch of the Department of the Interior.

W. Bromfield Brough, for the last three years resident manager of the hydraulic gold mining property on Williams creek, Cariboo, B. C., which the Cariboo Gold Fields, Ltd., of London, has been operating, recently left Barkerville on his return to England.

Chas. Camsell, of the Geological Survey of Canada, has been outfitting at Hedley and Princeton preparatory to entering upon the work of examining the Similkameen county from Kennedy and Copper mountains south to the international boundary line.

C. W McMeekin, mining engineer for the Britannia Copper Syndicate, operating the Britannia mine on Howe sound, British Columbia, lately returned from another visit to the Mt. Andrews mine on Prince of Wales island, Ketchikan district, southwest Alaska.

James Cronin, manager of the Consolidated Mining and Smelting Company of Canada, owning the St. Eugene mine in East Kootenay, War Eagle and Centre Star mines at Rossland, Canadian Smelting Works at Trail, and other properties in British Columbia, has been appointed a director of the company.

Charles A. Bramble has become editor of the *Canadian Mining Review,* at Montreal. He succeeds H. Mortimer Lamb, who resigned on account of ill health. Mr. Bramble has a wide acquaintance with Canada and its mineral resources. He was at one time on the editorial staff of the ENGINEERING AND MINING JOURNAL.

S. F. Luty is now associate editor of the *Industrial World,* of Pittsburg, which succeeds the *American Manufacturer.* He brings to his new work a thorough knowledge of the great industries of Pittsburg, and of the course of the iron and steel markets. Mr. Luty has been for a number of years the Pittsburg correspondent of the ENGINEERING AND MINING JOURNAL.

John L. Howard, of San Francisco, Cal., president of the Western Fuel Company, operating coal mines at Nanaimo, Vancouver island, was at Nanaimo during the latter part of June. The company has closed its Brechin mine, at Departure bay, consequent upon a considerable falling off in the demand for coal in San Francisco, which is the chief market for Vancouver island coal.

Calvin W. Rice has been appointed

secretary of the American Society of Mechanical Engineers, to succeed Prof. F. R. Hutton. Mr. Rice is a graduate of the Massachusetts Institute of Technology, and has had a wide experience in mechanical and electrical engineering. He has been an active member of the society, and is now chairman of the committee on papers and publication.

Lane G. Gilliam, of the firm of Thompson & Gilliam, Los Angeles, Cal., is now in Lower California, Mexico, making an extensive examination of some placer ground. He has been at this work now about three months, having taken a drilling outfit to the property, which is about 100 miles south of the international boundary line. He expects to complete his labors about the middle of July. C. Henry Thompson, of the same firm, has recently returned from Durango, Mexico, where he secured a copper property, situated near Velardena, for the firm, who have just completed arrangements for carrying on development work on the property.

Obituary.

Adolph Ledebur, professor of the metallurgy of iron and steel at the Bergakademie, Freiberg, Saxony, and an honorary member of the Iron and Steel Institute of Great Britain, is dead. Professor Ledebur was eminent as an iron and steel metallurgist, in which connection his name is known all over the world. In a subsequent issue, we hope to publish a fuller obituary notice.

Louis Cassier was killed in a railroad wreck at Salisbury, England, July 2. He was born in Boston, in 1862, but came to New York when 15 years old. He was connected with several publishing houses, and finally, in 1891, started on his own account, the publication of *Cassier's Magazine,* the well known engineering monthly. At a later date he became owner of the *Electrical Age.* He left New York for London, June 22, intending to be absent only a few weeks.

Joseph B. Sandford, who died at his home in Newark, N. J., July 5, was chiefly known as a successful contractor for dock and drainage work. He was born in Sussex county, New Jersey, in 1832, moving to Newark when a young man. In 1850 he went to California and engaged actively in mining. It is said that he was the first to suggest the hydraulic system of mining. In 1853 he went to Australia, where he was also engaged in mining for several years. After his return to this country he was a member of the firm of Sandford Brothers, afterward Sandford & Brooks, and carried out many large contracts for docks and similar work.

George H. Robinson died in New York, July 4, while on a visit to that city. He was widely known throughout the West, and was a mining engineer of high standing. He was born in Ohio in 1854 and went to Colorado in 1878, being then employed on a railroad surveying party. He soon turned his attention to mining and about 1880 went to Leadville, Colo., where he was employed by the Little Pittsburg Mining Company. A few years later he went to Montana on a government survey and was later in charge of the Drumlummon mine, owned by the Montana Mining Company. About 1890 he went to Utah, and was engaged in mining in the Tintic district. By this time he had secured a reputation, and his services were in demand. His time was divided chiefly between Utah and Montana, his office being usually in Salt Lake City. In 1898-1903 he was consulting engineer to the United Copper Company and F. A. Heinze in Butte. He gave up that position in 1903, and since then had spent much time in British Columbia, where he reorganized and managed the Britannia mine on Howe sound, in which he owned a large interest. In connection with this, he did much consulting work. His death was unexpected, and will be regretted by many friends. We shall publish a more extended obituary notice in our next issue.

Societies and Technical Schools.

Michigan College of Mines—This college at Houghton is making an effort to interest the people of the State generally in the study of its rocks and minerals. The college is desirous that the collection, which it is required to make by law, shall be of the widest possible use. The object is partly educational; partly also, it is economic. The more people in general are interested in, and have knowledge of, the mineral resources of the State, the more likely they are to be developed. To promote these objects, the College of Mines has undertaken to make up a number of subordinate collections or sets of specimens which shall contain a number of the more typical minerals and rocks of the State. No attempt is made to include all, even of the important rocks and minerals, though most of those which lend themselves at all readily to such a purpose will be found among the 38 minerals and 67 rocks of which each set is comprised. It is the intention to loan these sets of typical rocks and minerals of Michigan to such high schools of the State as may be giving instruction in geology, physiography or nature study, and may wish the aid afforded by such a collection. Since it is possible at present to prepare but a limited number of these loan collections each will be loaned to a particular school for a definite period, at the end of which, it will be passed on, in case other schools are applying and cannot be otherwise supplied. Naturally, one of the conditions of the loan is that the collection shall be put to active use in the instruction work of the school possessing it. Another is that it shall be kept at all reasonable times accessible to citizens of the community in which it is for the time located, who may wish to examine specimens of rocks or minerals which it contains. This is in order that it may be of service in helping others as well as the pupils and teachers to identify minerals or rocks which they may have found.

Sometimes specimens will be found which cannot be identified. To meet such cases, the Colloge of Mines is undertaking to identify material which may be collected in Michigan by pupils or citizens of the school district, provided such material is forwarded, carriage paid, through the science teacher, the principal, or superintendent of schools, and postage for reply is enclosed. In this way, one finding a specimen which cannot be identified by comparison with those in the collection, can, nevertheless, ascertain what it may be, and whether it is of value. Even in those portions of the State where there are no rock outcrops, the glacial drift and almost all stream beds contain interesting rock and mineral fragments, and much pleasure may be derived, and often useful knowledge obtained, from the study of these. The arrangement for identification of specimens includes such drift material as well as that found in its original place.

The collections have been prepared under the direction of Prof. A. E. Seaman. Under his direction also, there has been prepared to accompany them a concise, but clear and interesting book of 105 pages, called "Notes on the Rocks and Minerals of Michigan." In addition to descriptions of the specimens, it has an introduction showing their relations, and giving a condensed summary of the geology of the State, which they represent. Properly used, this book and the collections ought to stimulate interest in the geology and mineral resources of the State to a considerable degree.

Industrial.

The Westinghouse Machine Company has received a large order for mechanical stokers from the American Steel and Wire Company, Pittsburg, covering equipments for 19 boilers.

The well known firm of Beer, Sondheimer & Co., Frankfort-on-the-Main, Germany, has established an office in New York, at 42 Broadway, to develop its metal, ore and smelting business in America.

The Foos Gas Engine Company, Springfield, Ohio, has been obliged to enlarge its works by the growing demand for engines, and has just bought a number of machine tools for the purpose of increasing its output.

The Salt Lake City district office of the Westinghouse Electric and Manufacturing Company was removed on July 2 to 212-214 Southwest Temple street. The Dallas district office was also removed on

the same date to 418 Main street, Dallas, Texas.

The new works of the George N. Pierce Company, in Buffalo, N. Y., will be equipped with the Buffalo Forge Company's fan system of heating and ventilation. The first plant of this system made was put in the old Pierce works, 25 years ago.

The Sprague Electric Company announces that it has re-opened its office in San Francisco. The former office was destroyed by the earthquake, after which temporary quarters were opened in Oakland. The company is now permanently located in the Atlas Building on Mission street, San Francisco.

The Compressed Air Machinery Company, San Francisco, has its new works on Jessie street in operation, and is already at work on a new Ward drill maker and sharpener of large size, being adapted to make and sharpen 30-ft. drills, a special order for the Panama Isthmian Canal. This machine will be completed and shipped to destination in July.

The freight steamer "Ishpeming" was launched at the Ecorse yard of the Great Lakes Engineering Works, June 30, for the Cleveland Cliffs Iron Company. The steamer is a sister of the "Michigan," recently launched at the same yard. She is 550 ft. over all, 530 ft. keel, 56 ft. beam and 31 ft. deep. She has 33 hatches, spaced 12 ft. centers. Her engines are triple-expansion with cylinders 23, 37 and 63 in. diameters by 42 in. stroke, supplied with steam from two Scotch boilers, 15x12 ft., fitted with induced draft and allowed 175 lb. pressure.

The Indiana Steel Company, which is building the great steel plant for the United States Steel Corporation at Gary, Ind., has ordered nine Allis-Chalmers gas-engine generator units, each with a normal rated capacity of 2000 kw., to be installed in a central power plant at Gary, and to be operated from blast-furnace gas. These engines are standard Allis-Chalmers design, horizontal twin tandem, direct connected to Allis-Chalmers alternators, 25 cycles, 3 phase. Both the gas engines and the generators will be furnished by the Allis-Chalmers Company, Milwaukee, the gas engine being built at the West Allis, Milwaukee, works and the generators at the company's electrical works, Cincinnati, Ohio.

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

El Paso Foundry and Machine Company, El Paso, Texas. Bulletin 152. Sutton-Steele Dry Table; Pp. 2, illustrated; paper, 6x9 in.

A. D. Cook, Lawrenceburg, Indiana. Improved Tube Well Supplies, Steam Pumps, Etc.; Pp. 50, illustrated; cloth, 5x9 in. 1906.

De la Vergne Machine Company, New York. The Koerting Four-cycle Gas Engine. Folder, pp. 10, illustrated; paper, 4x9 in. June, 1906.

McLanahan Stone Machine Company, Hollidaysburg, Penn. Washing and Handling Hematite Ore, Phosphate Rock, Etc.; Pp. 36, illustrated; paper, 6x10 in.

Fort Wayne Electric Works, Fort Wayne, Indiana. Bulletin No. 1079. Direct-Connected Type MPL Direct-Current Generators for Power and Lighting; Pp. 12, illustrated; paper, 8x11 in. April 1, 1906. Summer Comforts; Pp. 23, illustrated; paper, 4x9 in.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1051. Allis-Chalmers Alternating Current Generators; Pp. 15, illustrated; paper, 8x11 in. May, 1906. Bulletin No. 1411. Modern Rock Crushing Plants; Pp. 47, illustrated; paper, 8x11 in. May, 1906.

The Stanley G. I. Electric Manufacturing Company, Pittsfield, Mass. Bulletin No. 613. The Stanley-G. I. Type "K" Arc Lamps; Pp. 15, illustrated; paper, 6x9 in. June, 1906. Bulletin No. 612. G. I. Flush Push Button Switch; Pp. 3, illustrated; paper, 6x9 in. May, 1906.

Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. Circular No. 1134. Electrical and Mechanical Brakes for Westinghouse Type K Motors; Pp. 9, illustrated; paper, 7x10 in. May, 1906. Circular No. 1129. Westinghouse No. 119 Railway Motor for Direct-Current Service; Pp. 15, illustrated; paper, 7x10 in. May, 1906. Westinghouse Alternating and Direct-Current Motors; Pp. 15, illustrated; paper, 6x9 in.

Construction News.

Bohemia, Oregon—A milling plant is to be put in at the Bohemia mine. Clarke & Hopkins, Bohemia, are owners.

Mill City, Nevada—The Sheba Mining Company proposes to put in a new mill. W. S. Zehring, Salt Lake City, Utah, is secretary.

Loope, California—The Hercules mill is to have 20 stamps added to it. T. F. Niland, Loope, Alpine county, Cal., is manager.

Calgary, Alberta—The Alberta Portland Cement Company, Ltd., is putting in a hoisting plant, consisting of 40-h.p. locomotive boiler, 7x10 hoisting engine, etc.

Twin Lakes, Colorado—The Boswell Deep Tunnel Company is testing its ores, with a view to putting in a mill to treat them. The address is Leadville, Colorado.

Logan, West Virginia—The Rex Coal and Coke Company is about to develop coal land, and will need machinery. John Hunter, Logan, W. Va., is in charge of construction.

Coleman, Alberta—The International Coal and Coke Company has let a contract for building 90 additional beehive coke ovens. The company is already using 100 similar ovens.

Belle Isle, Louisiana—The New Orleans Mining Corporation is preparing to put in machinery for mining salt and preparing it for market. R. S. Withers, New Orleans, La., is president.

Hazel Green, Wisconsin—The Murphy Mining Company is arranging to put in a concentrating plant with a capacity of 100 tons per day. The address is Hazel Green, Grant county, Wisconsin.

Telluride, Colorado—The Mayflower Gold Mining and Milling Company proposes to put in a wire-rope tramway from its mine to the mill, two miles. Leron Henry, of Telluride, is in charge.

Pandora, Colorado—The Japan-Flora Mines Company is considering the question of putting up a stamp-mill, amalgamating plant and concentrators. Col. A. G. Brownlee, Colorado building, Denver, Colo., is general manager.

Rossland, British Columbia—The Consolidated Mining and Smelting Company, of Canada, Ltd., has ordered for its Centre Star mine, Rossland, a Jenckes-Farrel crusher, 36x24-in. jaws, capacity 1000 tons crushed to 6-in. cube every 10 hours.

Slocan, British Columbia—Additional machinery is being received at the Ottawa mine, Slocan City mining division, including air compressor, hoist, pumps, etc. An electric-light plant is also to be installed. It is intended to sink a shaft from the 500-ft. level of the mine. The Ottawa is owned by Thos. A. Noble and others, of Pittsburg, Pa. R. J. McPhee is manager.

Portland Canal, British Columbia—The Brown-Alaska Mining Company, of New York, last month shipped from Vancouver 100-h.p. tubular steam boiler, air compressor, cable, etc., for an aerial tramway, 110,000 ft. of lumber for a wharf and ore bunkers, and other plant and materials for two mines it is developing near Portland canal. This company has copper mines and (in conjunction with the Alaska Smelting and Refining Company) smelting works on Prince of Wales island, southeast Alaska.

Boundary, British Columbia—The Dominion Copper Company, Ltd., Thos. R. Drummond, Greenwood, manager, has ordered from the Jenckes Machine Company, Ltd., of Sherbrooke, Quebec, two of its Farrel-Bacon pattern crushers, one 42x30 in. and the other 16x10 in. The shipping weight of the larger machine will be 125,000 lb., and its capacity per day of 10 hours 1500 tons crushed to a size not larger than a 6-in. cube. This is described as being the largest crusher yet made anywhere. Crushers of this style have for several years been in constant use at the mines in Boundary district of the British Columbia and the Granby Consolidated companies.

Special Correspondence.

San Francisco. July 4.

There is an immense demand for portland cement in San Francisco, and this is steadily increasing as the rebuilding of the city progresses. Reinforced concrete is becoming a favorite in construction work on large buildings and its increasing use is worrying the brick manufacturers and masons. There are only three large cement factories in California: one at Napa Junction, Napa county; one at Cement, Solano county; and one at Colton, San Bernardino county. The combined capacity is 4200 barrels daily, but the plants are being enlarged. A new plant to make 3200 barrels daily is in course of erection in Santa Cruz county. The quantity used in the State is far in excess of that manufactured here. With large deposits of lime and clay quite widely scattered over the State, and a cheap fuel supply, the cement industry should increase in importance rapidly. There were restrictions in this branch of manufacture, due to lack of cheap fuel, but this has been overcome by the opening of the great oil-fields. Under the normal conditions all the cement made here is used in the State, and now, with this sudden demand, immense quantities are being imported. One of the large construction concerns of this city has engaged 1000 barrels of cement a day to be delivered in August. Later in the year it is expected that the same firm will have to use 10,000 barrels a day.

The Mammoth Copper Mining Company is looking up silicious ores in Oregon to be used as flux in its copper smelters at Kennett, Shasta county, this State. The districts adjacent to Ashland are being examined with a view to obtaining a steady supply. The present transportation rates from Ashland, Oregon, to Kennett, California, amount to $2.40 per ton in carload lots, though if fair tonnage becomes available, the rate may be reduced to $1.50 per ton. The smelter makes no charge for treatment of these ores and pays 75 per cent. of the values contained, in cash, within two days of receipt. Shipments as small as 10-ton lots will be received. This makes it possible for the prospector, leaser and quartz mine owner to realize a fair profit on low-grade ores.

The Red Bluff Mining district in Tehama county is about being organized, and will include the Tom Head country, which is being rapidly located for copper mining claims. More than 300 acres of mineralized ground has just been transferred to the California & Massachusetts Copper Mines Company, and this corporation is surveying the land purchased for patents. Extensive development work will be done with a view of erecting a smelter on the property as soon as possible. The mining locations are being filed quite rapidly. Tehama has never been considered one of the mining counties.

The Siskiyou Electric Power Company has just completed the construction of a branch line to Quartz valley, Siskiyou county, 3½ miles from Greenview, to supply that section with electric power. The Morrison & Garlock mine has already signed a contract for 150 h.p., and other mines have made application. The company has in course of construction a tap from the main line on Cherry creek to supply 60 h.p. to the Golden Wonder mine, lately purchased by Los Angeles capitalists.

State Debris Commission Waggoner finds that Barrier No. 1 on the Yuba river is impounding debris very well. The deposits held back extend nearly to the Parks Bar bridge and amount to more than 1,000,000 cu.yds. The Hammon dredges, which are making the embankment, throw all the fine debris in the bottom of the hole, and cover it with cobbles and gravel, thus preventing much of the fine stuff from reaching navigable waters. They will have the great embankment now being constructed across the river completed this fall. The work is being done under agreement with the Federal Government and the State of California, and is for the purpose of turning the water of the river through the Daguerre Point cut, which will be accomplished this winter.

In the suit of J. E. Osselin against Thomas Oliver, Judge Nilon, of the Superior Court of Nevada county, has rendered a decision in favor of Osselin, holding that a deed from a railroad company to farming land includes mineral in the land. The points involved are of special interest to miners and farmers claiming land under conveyances from the Central Pacific Railroad Company. Owing to the terms of the land grant to that company and the peculiar exception clause in the patents issued to it, there has been much disputing and contention as to whether a railroad deed conveyed mineral land. The tract claimed by Osselin was patented to the railroad company in 1870, and by it conveyed to John Oliver, whose widow in turn conveyed it to Osselin. In the patent to the railroad company were the following words: "Excluding and excepting from the transfer by these presents all mineral land, should any be found to exist in the tracts described in the foregoing." Mr. Oliver claimed the land was mineral, has been known to be such ever since 1860, was therefore excepted from the grant and not conveyed by the patent, and was therefore open to location and in 1904 was located by him. Osselin at the time of the location was in possession of the land, cultivating it. Oliver went in, commenced mining, and took out some good ore, thus bringing on the suit. Osselin insisted that the exception clause in the patent was not authorized by law; that it was the duty of the Land Department of the United States, before it issued patent, to determine the character of the land, and it could not issue a patent without such determination; that it had no right to place the exception clause in the patent; that its issue was in fact an adjudication of the character of the land, which forever bound all courts in actions concerning the land and could not be overthrown except in an action in equity brought by the United States to set aside the patent for fraud or mistake; and that the excepting clause was void, and of no force. The court held the position taken by Osselin's attorneys sound, sustained their objections to all evidence offered which tended to show the mineral character of the land, and decided the case in Osselin's favor. The decision, if sustained by the Supreme Court, will settle the vexed question of the effect of railroad patents on mineral land. It is understood the case will be appealed.

Ketchikan, Alaska. June 25.

Information has reached here that the bill providing for the extension of the Government cable to Ketchikan and Wrangell was signed by President Roosevelt on June 13. The appropriation for this work is $179,000. T. J. Patterson, in charge of the cable office at Juneau, has been instructed to inform the department whether suitable buildings for cable offices are available at Wrangell, Petersburg, Ketchikan and Hadley. As Hadley is on Prince of Wales island it appears that its mining and smelting interests, which would use the cable to a considerable extent, are likely also to benefit by the extension. It is announced to be the intention of the department to proceed without delay with the laying of the cable, and to have it in working order by Sept. 30 next.

J. M. Miller, president of the Cymru Copper Company, has returned to his home at Tacoma, Wash., after having paid his first visit to his company's Cymru mine at North Arm. The wharf at the camp was recently completed, in time for the landing thereon of about 100 tons of steel rails, tram-cars, and other plant for use in the mine. The construction of ore bunkers, to have a capacity of about 1200 tons, has been commenced. The company is making small shipments of ore to smelters at Hadley and Coppermount, both on Prince of Wales island, Ladysmith, on Vancouver island, B. C., and Tacoma, Puget sound, Wash., for test purposes, with a view to determining where to arrange for the regular treatment of ore from its mine.

Hon. W. B. Hoggatt, the newly appointed governor of the district of Alaska, was banqueted at Ketchikan on June 16, some 70 men resident in Ketchikan district attending to do him honor. The toast of "Mining" was done justice to by G. L. Parker, superintendent of

the Brown-Alaska Company's several mines. While in the Ketchikan district Governor Hoggatt visited the mines on Prince of Wales island of the Brown-Alaska and Hadley Consolidated Copper companies, also the Alaska smelting and Refining Company's smelting works at Hadley, which were designed and erected by Paul Johnson.

The tug "John C. Potter," which brought in coke from Union, B. C., for the Hadley smelter, will have for return freight about 2000 tons of marble from the Shakan quarries.

The Red Wing mine lately shipped 140 tons of ore to the Tacoma smelter. The "Wellington" took another shipment of copper matte from the Hadley smelter to the Britannia Smelting Company's works at Crofton, B. C., to be there converted into blister copper for shipment to New York.

Butte. June 29.

Butte Coalition and Anaconda have begun working the veins of the Nipper, which were tied up several years on account of Heinze-Amalgamated litigation. The ore is coming through the Parrot shaft. Coalition owns 31/36 of the property and Anaconda the remainder. The output is not large now, but will be increased gradually to possibly 500 tons a day. Parrot is raising about 400 tons of its own ore.

North Butte is raising 1000 tons of ore a day, which is the capacity of the engine. The new engine and skips will be in operation within two weeks. The average daily output of ore from this property between June 1, 1905, and June 1, 1906, was 712 tons, but during three months of the year production was limited to between 500 and 600 tons by reason of the fact that its own shaft was undergoing repairs and the ore had to be hoisted through the High Ore shaft. Its output for 1906-7 is expected to be almost double that of last year. In gross value the ore of North Butte for the year exceeded that of any other mine in Butte, its average being $21.11 a ton. La France ore was second, its average being $15.26. Red Metal ore averaged $12.94 while this company operated the property and $8.83 while United Copper operated it. Boston & Montana ore averaged $12.82; Washoe, $12.05; Anaconda, $10.92; Parrot, $8.54; Original, $8.61; Trenton, $9.13, and Alice $8.23. The average daily output of ore by Amalgamated companies, North Butte, Red Metal, United Copper (the two last named operated the same property, the former four months and the latter eight months), Original, Alice, La France and Pittsburg was 12,241 tons, of which Anaconda produced 4168 per day, Boston & Montana 3314, United Copper (245 days) 1119, Red Metal (120 days) 1242, Washoe 261, Butte & Boston 675, Parrot 448, Trenton 462, Original 867 and La France Copper 90. The total number of tons mined by these companies during the year was 4,467,917, in addition to which possibly 250 tons were mined by Raven, East Butte and individual operators. The gross proceeds of the companies named outside of Raven and East Butte amounted to $52,328,662, and the net earnings $17,486,627, an increase of $7,548,668 over the previous year.

The greater number of the new companies organized to operate in Butte are working their ground. Butte & Bacorn, the property of which is in the extreme northern part of the district, is sinking three shafts, the deepest of which is down 150 ft. It is using steam machinery on all and is well equipped for work. Butte-Milwaukee is equipping its Pollock claim with machinery having capacity for 1500 ft., and Butte & London has about finished its new plant. Lewisohn General Development is sinking a new shaft and will drive a crosscut east from it to tap the copper vein discovered in the Bertha, which adjoins Lewisohn ground. The Bertha vein is on the east side of the flat and is 15 ft. wide. It has been opened to a depth of 100 ft. and about 80 ft. in length. Its course is north and south, while those of the west side are east and west.

Goldfield. July 3.

Goldfield continues to make steady progress. A large amount of work is now being done by leasers on a number of claims; a considerable proportion of them are doing well. At any rate, they seem inclined to stick to the camp and are not disposed to join in the rushes which are constantly being started to some newly discovered district.

The Nevada-Goldfield Reduction Company is preparing to install a Butters slime plant, to treat the slime from the mill. The plant has been designed by Mark R. Lamb, who secured the order for it. Much of the machinery for this company's mill is on the road and some of it is being put in place.

The latest find is reported at Buckskin, where W. D. Kennedy and others are opening the Kennedy mine, which promises well. A number of prospectors are at work in the neighborhood. Some ore has been shipped by the Kennedy party.

At Bullfrog a diamond drill has been put at work on the Bullfrog-Rush property, and another is on the way to the camp.

At Manhattan, a custom mill, with a capacity of 40 tons a day, is being erected. It will be equipped with Elspass rolls and other machinery, furnished by the Fairbanks-Morse Company. There are now eight steam and gasolene hoists in Manhattan, and 12 more have been ordered.

Tonopah. July 2.

Ore shipments over the Tonopah Railroad last week were 3124 tons, of which 2147 tons were from Tonopah, and 977 tons from other points. The outside camps shipped as follows: Lone Mountain, 45; Manhattan, 75; Goldfield, 857 tons. The Tonopah shipments were: Tonopah Company, 850; Tonopah Extension, 364; Belmont, 540; Montana Tonopah, 180; Midway, 100; MacNamara, 53; North Star, 60 tons.

The Tonopah Mine Operators' Association was formed this week, with the following officers and directors: Frank A. Keith, general manager of the Tonopah Company, president; Mark B. Kerr, general manager of the West End, vice-president; John G. Kirchen, general manager of the Tonopah Extension, secretary-treasurer; A. Chester Turner, superintendent of the Tonopah Company, assistant secretary-treasurer; W. J. Douglass, of the Midway, W. B. Alexander, of the Montana-Tonopah, B. F. Edwards, of the West End and MacNamara.

The principal objects of the association, as announced at the initial meeting, are to advance harmonious relations with the employees and to promote the mining industry in the district.

The following scale of wages has been adopted, to take effect Aug. 1.

	Hours.	Rate.
Miners	8	$4.00
Machine men	8	4.50
Top carmen	8	4.00
Muckers	8	4.00
Ore sorters	9	4.00 and $5.00
Timbermen	8	4.50
Blacksmiths	9	5.00 and 5.50
Blacksmith helpers	9	4.00
Carpenters	9	5.50
Engineers	9	5.00
Tool sharpeners	9	5.00
Electrician-wiremen	9	5.00
Machinists	9	5.00
Machine miner (shaft)	8	5.00
Miners (shaft)	8	4.50
Surface laborers	9	4.00

Foremen ore sorters are to have $5, and foremen blacksmiths $5.50 per day.

Among special objects stated in the constitution of the new association are the following:

"To adopt a uniform scale of wages and hours of labor per day for all classes of labor.

"To aid in discouraging and preventing strikes, lockouts and boycotts in said district, and so far as possible to promote the amicable settlement of all controversies between employers and employees.

"To adopt a uniform code of signals to be used at all the hoisting plants operated by the members of this association."

The wage and time scales are, of course, the most important and immediate objects in view.

Socorro, N. M. June 30.

The shaft of the Old Abe mine, in the White Oaks district of Lincoln county is said to be the deepest dry shaft in the world, but it will be sunk 200 ft. deeper to the 1500-ft. level. Many of the neighboring claims will soon be developed; the North Homestead has been getting out enough ore since last Novem-

ber, to keep its 5-stamp mill in steady operation.

In Mora county, veins of free gold have been discovered in a belt of schist that extends for several miles; it is supposed that the vein outcrops were washed clear of debris, so as to be visible, by last summer's flood. The owner of the find is the Tripod Mining Company and machinery has recently been brought in from the Rising Sun group, at Reriada, in San Miguel county.

There is hope of a revival at Cochite in Sandoval county, for the United States Mining Company of New York has directed Superintendent McNulty to reopen the Navajo mine. Some years ago, this property shipped several thousand tons of first-class gold ore, running $40 to $60, and there is understood to be now, not only a large quantity of $10 to $15 ore in sight, but a good chance of encountering other first-class ore shoots. The pay minerals are pyrite and various tellurides, containing the gold in a refractory form.

In Sierra county there are three parallel north and south ranges; the western is called Black Range at the north and Mimbres further south; the next is the Cuchillo Negro, an extension of the San Mateo range of Socorro county; while the furthest east is the Caballos ridge. In the Hillsboro district, the Sierra Mining Company has installed a 40-h.p. gasolene hoist in its Opportunity mine, in order to sink a three-compartment shaft, and is pushing work on its Snake and Eureka claims. It has purchased a traction engine and cars for hauling ore, and expects to build soon a 50-stamp mill of 250 tons daily capacity. The Black Peak mill is treating regularly the ore from the Wicks mines and is under direct charge of President M. F. Burks. A number of men are working the gold placers near Hillsboro this Summer. Near Kingston, the Empire Gold Company struck recently, on the 150-ft. level of its Good Hope bonanza mine, a 2-ft. vein showing high in silver and gold, which is as good as any strike of the old halcyon days. In Palomas Camp, the Palomas Chief Mining Company, managed by J. C. Plemmons, is hauling its ore to Engle, for shipment to El Paso. Near the head of North Percha creek, the Moffit Company, is erecting a 100-ton concentrate, to handle ore from its Virginia, Templar and Keystone locations.

It is rumored that the iron deposits of Iron mountain, near Elizabethtown in Colfax county, are soon to be opened. The extension of the Rocky Mountain & Pacific railroad to the vicinity, has rendered possible the working of these ores, which are of good quality, and in considerable quantity.

The Bromide district of Rio Arriba county, is lively. The Sixteen-to-One group was examined in the spring by G. J. Bancroft, of Denver, and L. Ionedes, of London, for Colorado capitalists, but their intentions were not announced. The 100-ton concentrating and leaching plant of the Tusas Peak Gold Company, is now being erected on Tusas creek with Chicago machinery and lumber got out by the company's own sawmill. The mill will cost $30,000, and will treat custom ore as well as the output of the Tampa and of the other mines of the Tusas Company. The Keystone-Bromide people will resume work as soon as litigation is settled; while the Sardine's owners and the holders of the Strawberry group have been busy in shaft sinking.

Salt Lake City July 5.

The National Development Company is the name of a new corporation just formed under Utah laws to do a general mining business. The president of the organization is Willard F. Snyder, general manager of the Western Exploration Company of this city.

The Boston Consolidated Mining Company, which has a mill under construction at Garfield, has placed an order for all of the transmission machinery. The Hill Clutch Company, of Cleveland, Ohio, secured an order which includes the shafting, pulleys etc., amounting to about $20,000.

The directors of the Bullion Beck & Champion Mining Company have posted a dividend of $10,000, payable July 2. This is the first distribution of the company since 1899. The mine is operated now on the leasing system.

The Honerine Mining Company, operating at Stockton, has succeeded in getting the American Smelting & Refining Company to grant some concessions on its ore contract. The fact that the company did not have an advantageous contract with the smelting concern is explained as one reason for the apparent indifference that has existed for some time as regards the production of ore.

It is expected that the concentrating plant of the United States Smelting, Refining and Mining Company, near Bingham Junction, will be ready for commission within the next two weeks. The plant will handle about 150 tons daily. The Bingham mines of the company are furnishing the furnaces with 100 tons of lead ore daily.

A consolidation of the properties of the Bristol Copper Company and some adjoining ground at Pioche, Nevada, has been effected, resulting in the organization of the Bristol Consolidated Mines and Smelting Company. It is stated that the new company will expend between $300,000 and $500,000 in providing new equipment, which is to include a smelter. The Bristol Company has been a regular shipper of copper ore to the Salt Lake smelters for some time.

The management of the Utah Copper Company is considering the advisability of providing more power for its mills and smelters than the plans for the new electric plant to be built at the new Garfield mill provided for. It is probable that 10,500 will be provided for, and that power will be transmitted to the mines in Bingham, a distance of 17 miles. According to estimates made of the cost of this plant it will aggregate $750,000.

A consolidation of the Goodsell and Imperial properties in the American Fork mining district has been effected by the organization of the Mountain Dell Consolidated Mining Company. The president of the company is J. H. Wooten, of American Fork; secretary, A. W. Raybould, of Salt Lake City.

The Ohio Copper Company is carrying out development along lines suggested by the engineers who were recently engaged to examine the property. The company is preparing to issue bonds to develop the mine and to provide it with equipment.

The Sheba Mining Company, operating in Humboldt county, Nevada, has levied an assessment of 10c. a share, calling for $50,000. A portion of the funds to be applied toward providing better mill facilities. W. S. Zehring, of Salt Lake, is secretary of the company.

The Boston Consolidated Company is now stripping overburden from its Bingham copper-bearing porphyries by a steam shovel. A second shovel will be placed in commission later. The Utah Copper Company will also begin stripping soon. It already has two shovels, and has ordered a third.

Coal in paying quantity has been found in Salt Lake county, and the Draper Coal Company, organized last May, is developing measures in a tract of 4500 acres. Henry Brown, of Murray, Utah, is president of the new company.

Articles of incorporation of the Little Edgar Mining Company have been filed, to operate in the Tintic mining district. John T. O'Brien, of Eureka, Utah, is president. The company owns the Grant group of lode mining claims.

Denver. July 6.

During the month of June the Cripple Creek district produced nearly 50,000 tons of ore, valued at about $1,500,000. This is a good record, since a number of the large mines have been to a certain extent inactive.

Judging from late shipments the general value of the Cripple Creek ores shipped to the smelters is higher than it has been for some time, averaging nearly $75 per ton. This is caused mainly by the recent rich strikes in the district. The sampling works are crowded with ore and a large amount is side-tracked at the different plants.

The Liberty Bell Gold Mining Company, of Telluride, has just purchased the Overlook and Tone claims for $14,000.

In consequence of difficulty in securing sufficient workmen it looks as if the Colorado Fuel and Iron Company's canal from a point below Florence to Pueblo will not be completed during the present year.

Since summer weather commenced it has been almost impossible for the contractors to keep a sufficient force of men at the work. There still remains about 15,000 yards of concrete work to be done, besides a large settling basin.

Senator W. A. Clark, of Montana, has just purchased a large amount of coal property near Trinidad and paid a personal visit there a few days ago. More coal than ever before is at present being produced in this State and the industry is becoming a very important one.

A flowing oil well seems to have been struck by the United Oil Company, north of Boulder. It would seem that the basin in that vicinity has been found at last.

A large number of claims have been staked in the vicinity of the Andracich ranch in Custer county in consequence of the discovery of some rich ore.

The Colorado & Eastern Railroad, which was purchased for a small price, about 10 years ago, will probably be the road by which the Omaha & Denver Short Line Railroad, backed by the Chicago Great Western, will enter this city.

Contracts will probably be let shortly for the construction of the Denver, Laramie & Northwestern Railway, between Fort Collins and the Elk mountain coal district in Carbon county, Wyoming, and for the construction of the line between Denver and Fort Collins. It is the intention of the promoters of this line to build to a connection with the Oregon Short Line and get an outlet to the northwest.

Leadville. July 7.

For the past month the Yak tunnel people have been quietly carrying on a great deal of prospect work with the diamond drill in different parts of the property, but more principally in the neighborhood of the North Moyer and Mike & Starr ground. Three drills have been kept busily engaged in this work, and the results have been satisfactory. Wherever the drill has gone down mineral has been found, and in a number of cases in large bodies. The ore channels were found from 200 to 300 ft. below the bottom of the tunnel in the second contact. The opening up of mineral in the second contact of this section of the camp places the camp on a more solid foundation. It is the intention of the company to sink winzes at different points in the tunnel, and develop the new orebodies. The tunnel is again being driven ahead, and has now passed No. 4 Little Jonny shaft 600 ft., to develop the Vinnie ground on the eastern edge of Breece hill; it will be driven another 700 ft. before the object point is reached, and will be beneath the Vinnie shaft 500 ft.; the shaft will be sunk to make connections, and to open the orebodies.

Connections have been made by upraise in the long drift from the Penrose to the Coronado, and now both properties are supplied with an abundance of good air. From now on additional connections will be made from the drift to the orebodies, and in the future all of the ores will be hoisted from the Penrose shaft. The solution of the water problem is at last settled, as the flow becomes less daily, and is now down to 1850 gal. per minute. From the Grey Eagle shaft 150 tons daily of manganese ore are being hoisted through the Penrose shaft; the Coronado is shipping 350 tons daily.

A great deal of work is at present being carried on in the Ball Mountain section, and a number of old properties have resumed work during the week, among them being the Green mountain and Tiger, both sinking on small veins of ore that carry good values in gold. The Green mountain shaft will go down another lift of 100 ft., when drifting will be started in different directions in virgin territory. From the 300-ft. level of the Sunday over 1000 tons of ore monthly are being sent out, carrying a heavy percentage in lead and good values in gold. To the south of the hill a number of claims have also resumed work, and whenever the roads become passable to the head of Iowa gulch, the Continental Chief will resume shipping.

Connections have been made with the new shaft on the Rock Dome, Rock hill, and the old workings and large bodies of hard lead carbonate ore have been uncovered. The old workings are in such bad condition that it will be impossible to take the ore out until the whole of the ground is re-timbered. From La Plata about 30 tons daily of good carbonate ore are being shipped, and the Reindeer, Murphy shaft, Bessie Wilgus and Sequin are turning out the usual quantity of ore daily.

On account of the backward spring at Twin Lakes and the amount of snow that still lies several feet deep in many of the upper gulches, the resumption of work for the summer on the leading mines has been held back. During the week a number of claims started up, among them being the Manhattan, Mining, Milling and Power Company, operating at Willis Creek. The crosscut tunnel into Twin Peak mountain is in 800 ft., and five veins have been cut, all good milling dirt. The company is also engaged in installing a power plant. The tunnel on the Sunnyside claim, the northern extension of the Gordon mine, Mt. Elbert, is in 400 ft., and driving on a vein that is 4 ft. wide, with a streak of rich ore in the center. The Boswell Deep Tunnel Company has a tunnel in 600 ft., with a vein of iron sulphide ore.

W. O. Reynolds, E. A. Hanifen, A. J. Davis and Harry Davis have secured a long lease on the R.A.M., Pyrennees and adjacent property, Iron hill, and will in a short time start work. The machinery on both plants was purchased. The ground secured contains large bodies of zinc.

The labor situation is far from being satisfactory, as there is such a scarcity of men that the Arkansas valley smelter at this point is only able to keep seven furnaces in blast, though it has sufficient ore to keep ten furnaces running steadily if the men could only be procured. Good practical miners are also scarce.

Platteville, Wis. July 7.

It is generally understood that the option that has been out on the Consolidated property near the Montfort camp is about to be taken up by some Denver parties. Messrs. Voak & Tabor have developed what promises to be a rich run of jack and lead.

The Sally Waters property was purchased last week by Kiel & Anderson, of Chicago. It is the intention to change the power from gasolene to steam and enlarge the present concentrating plant.

R. Brent, who represents the Montgomery Ward interests in the mining enterprise at Millbrig, reports satisfactory results. An unconfirmed report states that good cuttings were secured in the last hole on the Bell land. If this proves to be true a new camp will be added to the list.

The new 300-ton concentrating plant on the Mills Mining and Reduction Company's land, near Hazel Green camp, was put in operation during the week. At the Mills every care possible has been taken by the management to prevent unnecessary waste. Great care has been taken by the designer not to put in too many labor-saving devices and at the same time to utilize all feasible apparatus, as it has been demonstrated locally that a good zinc mine can be killed by too much machinery.

The Square Deal Mine has shut down temporarily. No specific reason is given.

The Mifflin-Linden Mining Company, operating the Coker mine, near Livingston camp, has just finished installing certain improvements and additions that will increase the capacity to 60 tons per 8 hours the improvements included a set of 24-in. rolls; a set of Cooley jigs and two dirt elevators. A new tramway is being built to connect the south shaft with the mill. The Coker is an example of the long life of the zinc mines in the Wisconsin district.

Scranton. July 10.

The Pennsylvania Coal Company, which is completing a large drainage tunnel in Dunmore to drain the mines in that territory into the Lackawanna river, is making plans to construct a still more expensive tunnel from the Susquehanna river to the high collieries in the Pittston district. The tunnel will be more than 4000 ft. in length, and will do away with a number of costly pumping stations.

Other important changes have been made by the Pennsylvania Coal Company in the same neighborhood for the purpose of concentrating its work. At No. 10 colliery work has been suspended to tear

down the old breaker, which at one time was the best in the entire system. A new breaker is being built at No. 9 colliery, which will be equipped with all the improvements, and that will prepare the coal mined at Nos. 8, 9 and 10 collieries. One breaker will thus do the work now carried on at three.

The old Hillman Vein mine in Wilkes-Barre resumed operations last week, after an idleness of 10 years. When the colliery was abandoned it was thought that practically all the coal had been taken out, but it was recently discovered that sufficient coal had been left to warrant the opening of the mine.

Fire is raging in the old Sioux workings near Mt. Carmel. A large force of men is at work drilling holes into the workings from the surface through which slush is to be run into the mine.

Several men were discharged at the Hazle Brook colliery of the J. S. Wentz Company for stealing tickets on cars. For some months there have been complaints by miners that they have not been credited with the proper number of cars. So serious was the trouble that the foreman decided to watch for the culprits and succeeded in detecting some foreigners in the act of stealing the tickets from the cars and placing tickets of their own instead.

A remarkable mining accident occurred at Centralia a few days ago when James Malarchy was killed by a stroke of lightning while at work in the Wilberton mine. The accident is said to be without parallel in the anthracite region. Just previous to firing a charge Malarchy was in the act of taking a mule to a place of safety, when the lightning struck a pipe leading to the mine and caused a box of dynamite to explode just at the time that Malarchy and the mule were passing the explosive. Both the man and the mule were blown into atoms. His companions who were some distance away were rendered unconscious. None were aware of the storm on the surface.

Toronto, Ont. July 6.

In reference to the complaints of the Cobalt miners and prospectors as to the rejection of claims by the mining inspector, Thomas W. Gibson, Deputy Minister of Mines, stated that some assertions as to the small percentage of claims passing inspection were entirely unfounded. It had been alleged as a cause of the dissatisfaction with the mining law, that only about 10 per cent. of the claims for locations in the Cobalt area were passed by the inspector. As a matter of fact, of the whole number of claims decided, including those staked out in the winter when the ground was covered with snow, one-third had been allowed, which under the circumstances was a very fair proportion.

The most important discoveries latterly announced have been on the Quebec side of the provincial boundary, and have caused much excitement both in Quebec and Ontario. A. Renault and Alphonse Olivier, prospecting on Osopatica lake, some distance to the north of Lake Timiskaming, found gold quartz and free gold. Samples were shown on their return to Ville Marie in confirmation of their statement. The find has caused a rush of applications for locations to the Quebec mining department.

Several prominent men in financial and scientific circles have recently visited Cobalt, among them being Frederick E. Weekes, and Donald Gillies, the latter formerly manager of the Tonopah Extension mine, who is now associated with the enterprises of Charles M. Schwab.

The claim of John H. O'Neill, located on Lot 4, concession 11, Lorraine township, where ore assaying 660 oz. silver to the ton was recently struck 3 ft. below the surface, has been sold to a syndicate, including John R. Brodie and William Law, of Winnipeg, and John F. Lennox and W. A. J. Bell, of Toronto. The McCrea property, near Mud lake, Coleman township, has been sold to C. A. Phillips, of Parry sound, for about $25,000. A Winnipeg company, represented by M. L. Foley, of that city, is at work on a claim in Buck township, and has also secured the old Guy-Girard copper property in Forbes township, Pontiac county, on the Quebec side. This has a vein of 6 ft. in width, running for about a mile, and is regarded as a very promising proposition.

At the Redeemer gold mine, in the Wabigoon area, crosscutting operations have disclosed a quantity of ore carrying iron pyrites. The shaft of the Victory mine in the same neighborhood has been unwatered preparatory to resuming operations.

E. R. Michie, manager of the sulphide mine near Pelican falls, north of Dinorwic, where operations have been suspended for about six months, lately visited the mine and arranged for the resumption of work. Transportation facilities will be secured by the construction of the Superior branch of the Canadian Pacific.

Victoria, B. C. July 3.

East Kootenay—At the St. Eugene, which is the largest lead-silver mine in Canada, there is now more ore in sight than at any previous time since the mine was opened. Jas. Cronin, general manager for the Consolidated Mining and Smelting Company of Canada, now owning this mine, says: "We are cutting down the grade and shipping ore and concentrates of lower grade than we did some time ago, but this is made feasible by the company owning its own smelting plant. Heretofore we have been shipping only higher-grade material, but now we are putting through the concentrating mill all stuff carrying values." Last week's shipments to the company's smelter at Trail totaled 1264 tons—an unusually large output for one week.

Rossland—The output of ore for the six months to June 30 will total about 168,000 tons. Of this quantity the Le Roi contributes about 62,000 tons, Centre Star and War Eagle nearly 82,000 tons, Le Roi No. 2 about 14,000 tons, the remainder coming from several smaller mines.

London. July 2.

The Penn-Wyoming Copper Company is about to offer some of its shares for sale in London. These shares are now being advertised by means of a prospectus. The capital of the company is $10,000,000 in shares of $1 each, of which $6,000,000 has already been issued. The present issue is 2,000,000 shares, and they are being offered at par. The issue is not being made by any English house, nor by people who are publicly known here, so that as far as the British public is concerned, the acquisition of shares is a leap in the dark.

A most instructive report on the Etruscan Copper Estates has just been issued by Messrs. Alexander Hill & Stewart; in fact it may be called the most valuable ever written on this much advertised mine. Your readers will probably remember its recent history, how Vavasour Earle, the cement man, and his friends, spent large sums of money on it, in spite of adverse advice by mining engineers of authority. Messrs. Alexander Hill & Stewart have now been directing operations for six months, and have had exceptional opportunities of ascertaining the exact condition of the property. They report that during five months they have been smelting 2 per cent. ore, and producing a 25 per cent. matte, which they have been able to sell to the Compania Metallurgica Italiana at a profit. Also that there is ready for stoping, or already broken down, some 17,000 tons of similar ore, which will keep the furnace going for another six or seven months. The bodies of ore which they have opened up have been disappointments, and the ore developed, other than that mentioned above, runs very low in copper, and is still decreasing as developments go on, so that it is doubtful if the ore is worth extracting. Messrs. Alexander Hill & Stewart consider that they cannot be of any further service to the company, and have resigned their position as consulting engineers, which means, of course, that there is nothing further at the mine for them to do. They have left in charge a capable and straightforward mining man and smelter, R. C. Alabaster, so that for a time, at least, operations will continue. Unless, however, Mr. Alabaster makes new discoveries, or finds he can make a smelting proposition of the lower-grade orebodies, the chances are that the mine and the company will have to close down. Vavasour Earle will probably advise his friends in future to take the advice of competent mining men before, and not after, their money has been spent.

General Mining News.

ALABAMA.

CLAY COUNTY.

Redding Graphite Company—This company has been organized at Macon, Ga., for the purpose of working a deposit of graphite in this county. W. A. Redding is manager.

CALIFORNIA.

ALPINE COUNTY.

Hercules Mine—This mine at Loope has a large body of low-grade ore, and manager T. F. Niland claims to be doing his mining and milling for 76c. per ton. Twenty stamps are to be added to the mill, which is run by electric power. The mine was formerly owned by Peter Curtz but was recently purchased by men at Reno, Nevada. Quite a large force of men is employed.

BUTTE COUNTY.

Golden Nugget—At this mine near Pentz, owned by G. R. and C. M. Hendrix and P. M. Reams the force will be increased as soon as men can be obtained. The mine is being worked down stream and the gravel is averaging about $2 per car.

Gravel on Butte Creek—Los Angeles capitalists have acquired the A. F. Hornung place near old Diamondville, comprising 120 acres and will mine it with dredges, resembling steam shovels, the machine working on the ground instead of in the water. Another Los Angeles company is said to have acquired 60 acres at Rich Bar on Butte Creek and will also install a steam shovel and sluicing plant. Still another company has taken hold of the R. F. Ferguson property of 150 acres, across the creek from the Rich Bar property, and will work it in a similar manner.

DEL NORTE COUNTY.

Shelly Creek District—Messrs. Owens and Britten, who own a group in this district, are doing extensive development work. They are running tunnels and already ore has been encountered. The Momumental mines are in the same district.

INYO COUNTY.

Alta Vista—Work has been resumed on the claims near the summit of White mountain peak at this place, southeast of Bishop. Discoveries were made there last summer, though little development work was done. A company is to be organized.

KERN COUNTY.

Gold Peak Mining Company—This company recently started a well equipped 10-stamp mill on the Rada mine in Amalie district. Previously the ore has been shipped to the Selby smelter.

MONO COUNTY.

Midnight—The hoisting works at Segourney Flat have been pulled down and taken to Bodie, where they will be erected on the Midnight claim, the property bonded by Denver capitalists. Two shifts, including 25 men, are now employed in development work.

Masonic District—In this district a force of men has been set at work on the Pittsburg-Liberty group. The Home View, owned by the Compston family, has been bonded to a Colorado company for $25,000.

MONTEREY COUNTY.

Grey Eagle—W. D. Cruikshank has secured an option from Peter Gillis on the Grey Eagle mine, on Gold Ridge, from which many famous nuggets have been taken.

Cholame Ranch—On this ranch of 63,000 acres, owned by R. E. Jacks, gold-bearing gravel has long been known to exist. W. S. Cather and T. D. Rogers of Coalinga, have obtained a 10-year lease of some of the ground at one-tenth royalty, and will build a reservoir, ditch and pipe-line to bring water to the gravel.

NEVADA COUNTY.

Grant King—This mine at Washington is to be opened by tunnel. The ledge is from 70 to 90 ft. wide and of low-grade ore. It is expected that a large mill will be put up in due time.

Banner—In this mine, Nevada City, the shaft has gone down 125 ft. since sinking was resumed, giving a total depth of over 800 ft., and the company proposes to go to a depth of 1200 ft. in all.

Martini Gold Mining Company—This mine, southwest of Grass Valley in Kentucky ridge district, is having a shaft sunk upon it by J. W. Jaquith.

Woodbury—At a meeting of the miners who have a bond on the old Woodbury mine, it was decided to procure a steam pump for installation as soon as possible. Until the late heavy rains the shaft was kept unwatered by means of large tubs, but such a heavy flow is now coming in that this system is wholly inadequate. As a result operations have been suspended until a better equipment can be installed.

PLACER COUNTY.

Long Beach Asbestos Company—This company has been organized to work an asbestos property in Green Valley, on the American river near Dutch Flat. R. R. Curtis and W. N. Weed are the principal owners.

SAN LUIS OBISPO COUNTY.

Garibaldi Quicksilver Mine—B. F. Martin, E. E. Stacy and E. R. Hamilton of this mine, at Cambria, have acquired the ground on which the mine is located, taking up the bond which Mrs. J. B. Compher, the owner of the land, signed two years ago.

SHASTA COUNTY.

Mad Ox—This old abandoned mine is being reopened by the Caribou Mining Company, N. W. Keith, manager, which has it under bond. A 10-stamp mill is being placed on the mine.

Lone Star—This claim, about a mile west of the famous Iron Mountain mine, is now being worked, and is showing up better than was expected.

COLORADO.

SAN MIGUEL COUNTY.

Gold Development Company of Utah—Last year this company secured control of the Silver Pick and Special Session groups, located on Mt. Wilson, 20 miles from Telluride, and did considerable development, which has been resumed this season. The third level on the Pick is being driven to connect with the lower workings of the Session, and it is calculated there are only 350 ft. to drive. When completed, the product of the Session will be handled through the Pick workings and delivered over the tramway to the Silver Pick mill. The Special Session vein carries 4 ft. of solid mineral, carrying chiefly gold. The eighth level on the Pick is also being pushed into the mountain and will intersect the vein several hundred feet below the lowest of the upper workings. A force of men will shortly be put to work overhauling and repairing the mill and tramway and they will be put in operation in the near future. It is the intention to enlarge the mill by the addition of 10 stamps. The company expects to expend $250,000 on development and to put the groups in shape for systematic and economical working. E. L. Davis, of Telluride, is associated with the management of the property.

Golden Shaft Mines Company—This company, owning the Golden Shaft, Laura and other lodes on Ballard mountain, within three miles of Telluride, will within the next two weeks put a force of men to work developing the Golden Shaft and Laura. A large mill-run for testing purposes will be taken out as soon as possible. E. L. Davis, of Telluride, is manager of the property.

Mammoth & Buckhorn Group—M. A. Wood and Adolph Helin, of Telluride, owners of this property, are constructing a 10-stamp mill on Bear creek for the treatment of the product. The veins of the group are large and composed of white and brown quartz throughout. If the mill returns are satisfactory, the capacity of the plant will be increased by the addition of more stamps, as the group is susceptible of a large output.

Menona Mining and Milling Company—This company's property in Savage basin, five miles from Telluride, embracing principally 3700 contiguous ft. on the Columbia-Menona vein, is being operated under lease by John P. Olson, a business man and alderman of Telluride, and John B. Olson, a well known mining man. The lessees are working 70 men, and the Menona 30-stamp mill is treating 100

tons of mineral in 24 hours, which is concentrated on the ratio of 12 and 15 tons into one. The high-grade ore is shipped in its crude state to smelters. A peculiarity of this property, characteristic of others in the district, is that while the leasers are realizing a fair profit, the company was unable to make expenses when it operated the mines 9 to 12 years ago. The mineral carries gold, silver, lead, zinc, and copper, and the vein is from 2 to 8 ft. in width.

ILLINOIS.

Cornelius J. Cahill and John D. Cahill, of Peru, Ill., have purchased the one-half interest owned by the late Charles J. Devlin, of Kansas, in coal mines in Tazewell, Woodford and Marshall counties, Ill. The sale was made by the trustees of the estate of Mr. Devlin, and the consideration was $92,318. In it is included a one-half interest in the Tazewell Coal Company mine of Pekin, the mines of Roanoke, Woodford county, and Toluca, Marshall county. The Duggan Bros., of Pekin, owned the major portion of the other half interest.

MADISON COUNTY.

Madison Coal Corporation—This company has bought the Brush and Colp mines, formerly owned by the St. Louis & Big Muddy Coal Company. The price paid is said to be about $600,000. These mines have been prominent in the past, as they were among the few in southern Illinois operated by non-union labor.

MARION COUNTY.

Centralia Coal Company—This company has been organized with $400,000 capital, and has bought the Centralia and the Pittinger & Davis mines near Centralia. H. E. Bell is president; Robert H. Davis treasurer and general manager.

KANSAS.

CRAWFORD COUNTY.

Central Coal and Coke Company—This company has taken options on 2100 acres of coal, situated five miles northwest of the town of Pittsburg. Prospecting parties have already begun work on the tract.

LOUISIANA.

ST. MARY PARISH.

New Orleans Mining Corporation—This new company has bought the salt property on Belle Isle, formerly owned by the American Salt Company, and proposes working it on a large scale. R. S. Withers is president of the new company; William P. Luck, vice-president; R. L. Himel, secretary.

MICHIGAN.

ONTONAGON COUNTY—COPPER.

Mass—The rock-house at shaft C of the Mass mine has been completed and shipments of rock have increased. Delay in the completion of this structure was caused by slow deliveries of western timber. The new rock-house is 40x50 ft. in size and has two 18x24-in. crushers. It has installed a system of handling rock, designed by the executive staff of the mine, and all ore is sized as it is dumped from the skip, except the largest pieces.

MISSOURI.

ST. FRANCOIS COUNTY.

Bogy Tract—The well known Bogy land at Bonne Terre, which is regarded as one of the richest pieces of ground in the county, is to be thoroughly drilled; a new drill was shipped in for this purpose last week.

Central Mine—The Federal Lead Company is sinking a new shaft on the west 40-acre track that adjoins the Doe Run mine, where an excellent orebody has been found by drilling. Work has been started on the new 1500-ton mill for the Central mines, but after putting in the foundations, a difference arose with the contractor that has temporarily stopped the work.

Doe Run Lead Company—The new shaft on the Mitchell tract is being sunk with electric power, furnished from their power station at Central.

Madison Lead Company—The new 400-ton mill has been started at the Catherine mine to take care of the increased production, while the old mill on the St. Francois river has been improved.

North American Lead Company—Designs are being drawn for a new smelter to handle 300 tons daily, and will also utilize the nickel ore.

MONTANA.

LEWIS & CLARKE COUNTY.

It is reported that work has been begun on the great porphyry dike on Red Mountain, in the Rimini district, which is owned by Charles D. McLure, of St. Louis, James Breen, of Spokane, and F. A. Heinze, of Butte. It is also stated that the owners have taken up water-rights on the Blackfoot river, near the mine, where a large water-power can be developed. The dike is a large deposit of gold ore of very low grade, but it can be cheaply mined and worked. It is said that the workings will be conducted on a large scale.

SILVERBOW COUNTY.

Boston & Montana—In Butte this company has begun re-timbering the shaft on the Mountain View between the surface and 900-ft. station, and expects the job to last about seven weeks. It is hoisting the ore through a two-compartment air shaft southeast of the old shaft, which connects with the 1000-ft. level. This opening has been made since the first of the year. The output of the mine was 900 tons a day, but it is now 700, this quantity being all that can be handled. When the old shaft is again ready for use, the new engine, with which it was equipped last winter, will be operated and skips will take the place of cars and cages. This means an increased production of at least 200 tons a day. The new engine on the Leonard will not be in operation before August 1, although it is set up. The boilers and other machinery are not yet in place.

Butte Copper Exploration—This company's shaft is now down 683 ft. Two pumps have been ordered, one for the 600 station and the other for the 1000-ft. level.

Davis-Daly Estates Company—This company, the Butte unit of American Consolidated Copper, has added the Silver King and Plymouth claims to its group, paying $250,000 for the former and $50,000 for the latter. Both are valuable. The company is preparing to begin the development of its ground.

La France Copper—This company at Butte has discarded its electric pump and returned to the use of steam. Its two 1200-gal. tanks are hung up and will remain inactive until the water is below a bulkhead near the 600-ft. station.

North Butte—This company began hoisting ore with its new engine July 2, but will not be working to capacity until the middle of the month, at which time the skips and skip-pockets will be finished. The output of the property is 1000 tons a day. It will be worked up to between 1400 and 1500 tons after the skips are in place. The engine was built by the Nordberg Machinery Company and is good for 3000 ft. depth.

NEVADA.

LINCOLN COUNTY.

Nevada Consolidated—About 90 miles of the railway to Ely have now been completed, and it is expected that the remaining 40 miles will be finished by August 15. Work will then be begun on the smelter, which will have capacity for the treatment of approximately 5000 tons of ore per day, instead of 1000 as originally planned. It is figured that an output of 60,000,000 lb. of copper per year will be made after the plant is in full operation. It is claimed that present developments show upward of 25,000,000 tons of ore in the property.

OREGON.

BAKER COUNTY.

Blue Bird—The tunnel on this property in the Granite district is now in 1900 ft., and has cut an orebody carrying free gold. The mine is owned by Wheeler & Co., of New York; O. C. Wright is manager.

DOUGLAS COUNTY.

Oregon Securities—This company has

struck an ore-shoot in a new crosscut of the Broadway group. The ore is better than anything that has before been found in the Bohemia district. The Oregon Securities Company owns three mines and is developing them from one long crosscut. The Helena, Musick and Champion have all been heavy producers, and now their ores are milled at one mill in the Champion basin. The company has an electric plant, and the power is generated by water. The present mill consists of 30 stamps.

Great Eastern—A force of men is at work on the No. 1 group of mines owned by this company and has encountered some concentrating ore. The ore carries silver, besides good values in gold and copper.

Combination—Clarke & Hopkins, who have a bond on this mine, are getting in shape to put in a milling plant this season. They have cleaned out the old workings and opened up a shoot of ruby silver ore. These people will install a mill and concentrator to treat 10 tons per day.

Star—This property is being surveyed for patent; it consists of 13 claims, on which is a five-stamp mill. A crosscut is being started to tap all the ledges on the property at depth, and is now in 135 ft., cutting one ledge which shows up good ore.

Twin Rocks—This property, consisting of 11 claims, is under systematic development, and some good ore has been opened up in the various workings. The company is now running a crosscut tunnel to tap the various ledges. This property has been incorporated and stock put on the market.

Hiawatha—The machine drill recently purchased by this company is in operation and considerable development is being done.

PENNSYLVANIA.

ANTHRACITE COAL.

Philadelphia & Reading Coal and Iron Company—This company's financial statement for May and the 11 months of the fiscal year from July 1 to May 31 is as follows:

	May.	Eleven Months.
Earnings	$2,773,783	$30,769,305
Expenses	2,776,806	29,219,751
Net, or deficit	D. $3,023	N. $1,549,554

For the 11 months, as compared with the previous year, there was a loss of $2,594,412 in earnings; a decrease of $1,764,854 in expenses; and a resulting loss of $829,558 in net receipts.

Lehigh Coal and Navigation Company—The stock of this company was placed in trust nearly two years ago, when negotiations were pending for a sale. Now a petition has been presented by a number of shareholders to the voting trustees asking that they exercise their discretion in the sale of the trust certificates in their charge, so as to make the minimum price $200, should they at any time dispose of the property. The signatures represent 100,000 shares. The shares are $50 par value. In the petition a number of reasons are given to account for the higher minimum price, the former figure having been $135 a share. One of the reasons is that if the company's canal were equipped to its utmost capacity it could divert from the rail shipments upward of 2,000,000 tons of coal per annum at an approximate saving of more than 30c. per ton.

BITUMINOUS COAL.

Cresson & Clearfield Coal and Coke Company—This company has been sold by the Widener-Cochran syndicate to J. Blair Kennerly, of Philadelphia. The company owns 7200 acres of coal land in Blair and Cambria counties, on which three mines are now in operation, producing 2500 tons of coal daily. On taking possession, Mr. Kennerly has reorganized the company with $1,000,000 capital. The officers chosen are: President, J. Blair Kennerly; secretary and treasurer, James P. Platt; directors, J. Blair Kennerly, J. P. Platt, J. Henry Kennerly and Arthur Coppinger. All the officers and directors are in the employ of the purchaser, and he will direct the management of the company. It is Mr. Kennerly's intention to increase the production of the property and to place in operation 100 coke ovens which have been idle for the last two or three years.

SOUTH DAKOTA.

CUSTER COUNTY.

The Hub—A transfer has been made of this property, one of the best known mica mines in the Southern Hills, to parties in Wisconsin, for a consideration of $11,000. It is located five miles southwest of Custer.

Saginaw—The new Knowles pump, 8x12, has arrived and has been placed in position. It has a capacity of 63 gal. per minute. The company will now continue sinking its shaft.

LAWRENCE COUNTY.

Dakota—At the annual meeting of this company the following officers were elected for the ensuing year: President, Sam Schwartzwald; vice-president, James Hartgering; secretary and treasurer, J. G. Thomas. J. G. Thomas has been appointed general manager of this company, and Mike Curnow will be retained as superintendent. The cyanide mill is now treating 115 tons of ore daily, with a good extraction.

Homestake—The Monroe mill, at Terraville, and the Mineral Point, at Central, are now being run by electricity. The company's electric plant is located at Englewood and is operated by water power. Each of the mills has 100 stamps, and is equipped with 10 motors, so that in case it is required to hang up a given battery, the remainder of the mill need not be interfered with.

Homestake South Extension—The crosscut being driven to the east to intersect the Slavonia copper-gold vein 400 ft. distant is in about 70 ft. and the crosscut to the west to cut the gold-bearing vein cropping out 125 ft. from the shaft is in about 50 ft. At the depth of 100 ft. a 15-ft. orebody, assaying $2 in gold and from 1 to 2 per cent. copper, was encountered.

Globe—The main orebody has been opened up for a distance of 40 ft. at the apex of the hill, and the sidewalls have not yet been reached. The tunnel being run 257 ft. below the apex to cut this orebody is now in over 200 ft. A test run recently made proved that the ores are amenable to cyanide treatment, as a little over 75 per cent. extraction was obtained.

Gold Queen—Work has been resumed in the main shaft of this property in Whistler gulch. A four-drill air compressor is being put in.

Spearfish—A letter sent out by the president of this company proposes to the stockholders a plan for raising money for further development. It includes increasing the capital stock 500,000 shares and issuing bonds to the amount of $50,000 in small denominations. The money thus obtained is to be used in exploring the lower ore measures by means of a diamond drill.

Dakota—The development of the Mono claim, where the recent strike was made, shows that the new orebody is extensive. The ore was discovered about 17 ft. from the surface.

Mogul—This company, formerly the Horseshoe, is removing the old machinery from the Kildonan mill and making arrangements for installing the new. The ore will be crushed in a Gates crusher, will pass from there to the rolls and then to the four Chilean mills. A tube-mill will be added to the equipment for fine grinding. The slimes will be treated either by the Moore process or by the filter press. The mill will be in operation some time early in October.

Big Four—The main shaft has reached a depth of 265 ft. and work will now begin drifting north to crosscut the east vein, which is 40 ft. wide at the surface. Another crosscut will be driven from this same level to tap the west vein. Plans for the erection of a mill are under consideration.

Homestake—A large steam road roller has been used to make a solid and well packed gravel foundation for the concrete floor of the filter-press room in connection with the slime plant. The room will be 65x270 ft. and will contain 24 presses, each of which will have a capacity of 70 tons every nine hours, making a total of 1400 tons daily.

PENNINGTON COUNTY.

Lucky Baldwin—The annual meeting of

this company has been held in Lead and the following officers elected: J. P. Wilson, Denver, president; George E. Fell, Denver, treasurer; Charles Searle, Lead, secretary; with W. A. Cooper, Denver, and Joe Gordon, Hill City, directors. A contract will be let at once to sink the shaft 100 ft., which will give it a depth of 125 ft. The ore is cyaniding and can be easily handled.

Mineral Lode—A new vein, encountered at a depth of 40 ft., carries free gold, and is of good width. The small Huntington mill will soon be put in operation.

TEXAS.

JEFFERSON COUNTY.

Beaumont—After a two weeks' trial in the case of the Jeff Chaison Townsite Company vs. the Guffey Petroleum Company the jury brought in a verdict for $23,120, for breach of contract to develop five acres of land at Spindletop. The principal features of the month of May were the advance of 2c. in crude prices; the active development of the upper sands in the Humble field; the increased output of southern fields and the proving of a new field at Hoskins Mound, in Brazoria county which has stimulated the formation of new companies to drill wildcat wells. Although the May production reached 1,986,000 bbl., storage oil was drawn on to the extent of 500,000 bbl. Credit balance, prices and daily production are as follows: Sour Lake 6400 bbl.; 51c. Saratoga 8300 bbl.; 42c. Batson 7500 bbl.; 43c. Humble, 14,000 bbl.; 45c. Spindletop 3000 bbl.; 54c. Jennings, 24,700 bbl.; 34c. Hoskins Mound, 1500 bbl.; Dayton, 150 barrels.

Well summary for May is as follows:

	Completed.	Producers.	Dry.	Drilling.
Humble.....	63	47	16	54
Batson.....	4	4	0	10
Saratoga.....	8	5	3	7
Sour Lake...	7	5	2	13
Spindletop...	7	1	6	7
Jennings.....	4	0	4	13

This is a total of 93 wells completed and 62 producers, 31 having turned out dry holes.

UTAH.

JUAB COUNTY.

Uncle Sam Consolidated—Developments made on the 700 level show a continuance of the orebody from the upper levels.

Mammoth—The company is extracting ore from the lower levels averaging around $30 per ton. A winze being sunk below the 2000 level is down over 200 feet.

SALT LAKE COUNTY.

Ohio Copper—The Bingham mill of this company, is now equipped with 20 concentrating tables, two vanners, four Callow classifiers and a half dozen jigs.

City Rocks—Recent developments at the Alta mine, have disclosed a new shoot of ore. The extent of the body is yet to be determined.

Montezuma—The ledge in this Bingham property was encountered on the 200 level this week in a crosscut from the shaft.

Consolidated Flagstaff—The tunnel being driven has encountered the seventh fissure at a distance in from the portal of 1240 ft., and at a vertical depth of 350 ft. The compressor plant is being installed. The property is located at Alta.

Silver King—This is a new Alta property that has begun regular shipments to the Salt Lake smelters.

SUMMIT COUNTY.

Silver King Consolidated—The shaft has been sunk to 1240 ft. depth. The bottom is showing heavy mineralization.

Jupiter—The management has purchased a second-hand mill in Park City, which will be moved to the mine and placed in operation. The company is shipping some high-grade ore.

Park City Ore Shipments—Shipments last week aggregated 4,667,460 lb., the shippers and amounts being: Daly West, 1,140,000; Daly Judge, 1,078,000; Daly Judge (middlings), 575,000; Kearns-Keith, 219,000; Silver King, 1,148,460; Little Bell, 458,000; Jupiter, 49,000 pounds.

Nelson—A new steam hoisting plant is being installed at this property.

TOOELE COUNTY.

Overland—Development continues vigorously at this gold property at Sunshine. The mill will probably go into commission within sixty days.

WASHINGTON.

FERRY COUNTY.

Anonymous—The lower tunnel is in 260 ft., and still in the hanging-wall formation, but considerable water is coming in at the face, which is taken as an indication that the vein will soon be encountered. The upper tunnel is in 60 ft., and is breaking through the hanging wall into the vein. Ten or 12 test pits have been sunk in ledge matter at the surface, and ore has been found which runs well, mostly in copper. A. C. Cook, for a long time foreman at the Mountain Lion mine and later at the Pearl Consolidated, is in charge.

San Poil—The upper workings are under lease to W. M. Crummer, the former superintendent, who is cleaning up and preparing to take out ore.

Ben Hur—Work on the mine has been temporarily suspended. The reason has not yet been made public.

White Swan—Samples of ore have been tested at various smelters, and the company is driving a tunnel to get in under the upper workings, hoping soon to strike the vein and begin shipping.

Meteor camp, in which the White Swan, Meteor and Independent are situated, has many fine prospects of high-grade and big veins of low-grade ore. It is attracting more than usual attention now. It is situated in the western part of the county, on the south half of the Colville Indian reservation.

OKANOGAN COUNTY.

Kimberly Group—J. J. Bennett, who bonded these claims, has organized a company in the East and expects to begin operations in July.

STEVENS COUNTY.

Bonanza—A great deal of development work was done on this property, situated at Bossburg, some years ago, but operations were suspended, and the machinery removed. Canadian capital was enlisted, and now work is to be resumed and new machinery installed. It is estimated that the mine will produce at present 1000 tons a month.

Lucky Bill—This property, situated 4½ miles northeast of Newport, is looking promising. A new vein was discovered about three weeks ago in driving from the shaft. It is 4 ft. wide at the face of the drift. The value of the ore at the face is one-half in gold, and the remainder is in copper and silver.

WEST VIRGINIA.

LOGAN COUNTY.

H. T. Wilson Coal Company—This company, a Detroit, Mich., concern, has been incorporated in this State to work a coal property near Logan. H. T. Wilson, Detroit, Mich., is president.

Rex Coal and Coke Company — This company has been incorporated, with office at Logan, and has leased 1150 acres of coal land. Operations will be begun at once. J. B. Neal is president and general manager, C. E. Kinzer vice-president and general superintendent, and W. R. Godfrey secretary-treasurer, all of Rock, W. Va. John Hunter, of Logan, is chief engineer of construction.

MC DOWELL COUNTY.

Keystone Coal and Coke Company—An explosion of gas in the No. 1 entry of this company's mine at Keystone killed three men on July 2. The men were passing along an old abandoned entry, when it is thought the gas ignited from their naked lights. The shock was felt throughout the workings, and several other miners were fatally injured. A number of those acting on the rescue party were overcome by the after-damp.

WYOMING.

BIG HORN COUNTY.

Charles W. Gebo, representing Eastern parties, has bought 12,000 acres of land 12 miles north of Thermopolis. Coal has been located on this land by several parties. The tract is about 12 miles from the nearest railroad point.

FREMONT COUNTY.

Shoshone Coal Company—This company, having an office at Lander, has sold its property to Charles W. Gebo,

representing Eastern parties. The property includes 2080 acres of land, near Lander, on which a small mine has been opened.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA.

The Granby Consolidated Company is adding to its smelting plant at its works at Grand Forks, British Columbia, two Connersville Jumbo blowers, to meet additional blast requirements following the enlargement of several of its copper blast furnaces, and four 150-h.p. induction motors to drive these blowers. The Jumbo blower installed late last year has a capacity of 30,000 cu.ft. of air per min., and has a double drive, being operated by two 150-h.p. induction motors. It is the largest blower in Canada. Those about to be installed are of similar make and capacity. Three more electric motors for furnace automatic charging purposes are being obtained, and another large power pump having a capacity of 750,000 gal. per diem. The work of putting in a third converter stand, of the horizontal barrel type, is already well advanced.

The Crow's Nest Pass Coal Company, Ltd., is installing at its No. 9 mine, Coal Creek Colliery, near Fernie, southeast Kootenay, a Wilson fan, similar to that supplying air to Nos. 2 and 3 mines, which is 12 ft. face and 16 ft. diameter, capacity 250,000 cu.ft. of air per min., and discharging about 150,000 ft. at 0.9 in. water gage. The output of No. 9 mine being now about 600 tons per diem, the fan in use during development operations is now too small to properly ventilate this mine. A new tunnel is being driven in No. 9, to be completed by the time the new fan shall be ready for operation—about the end of July.

NOVA SCOTIA.

Dominion Iron and Steel Company—At the recent annual meeting, it was announced that the directors were preparing to erect a converter plant for the preliminary treatment of pig iron to shorten the open-hearth process. It was hoped to have it in operation by next spring. The total sales for the year were given as follows: Pig iron, 23,393 tons; billets and blooms, 17,145 tons; rails, 101,245 tons; wire-rods, 45,553 tons.

MEXICO.

SONORA.

America Mining Company—Arrangements have been made to ship 1500 tons of the high-grade ore recently encountered in the Bonanza shaft. This ore is a black copper sulphide ore carrying also values in silver. A 125-h.p. hoist has been ordered for this shaft and the gallows frame is ready for erection.

El Pinito Mining Company—This company, having settled the legal difficulties which have prevented the mine being worked, has again resumed production. The mine is in the Magdalena district, about 20 miles north of Ymuris, and the ores are handled at the mill of the company. Sixty men are at work in the mine and mill, and 80 more are being used to build roads through the property.

Oro Maximo and Picacho—These mines are owned by the Oro Maximo Mining Company and El Picacho Gold Mines Company and are located at Basaitequi and Picacho, about 40 miles from Cananea. There are 500 men employed at the mines and in erecting the mill of that capacity. It was rumored in Cananea that there had been a strike at these mines but this has proved to be false.

Southwestern Mining Company—The property of this company is located within six miles of Cananea and there are about 80 men employed. Despite the nearness to the seat of trouble the agitators did not get to the camp and the men did not strike. The main development shaft is down over 200 ft., and is in ore carrying copper and silver.

AFRICA.

TRANSVAAL.

Cable reports give the production of the Transvaal mines for the month of June at 475,975 oz. fine gold; which is an increase of 14,773 oz. over May, and a gain of 63,658 oz. over June, 1905. This output is the largest ever reported in one month. For the half year ending June 30, the total was 2,656,467 oz. fine gold, or $54,909,173. This is a gain of 295,697 oz., or 12.5 per cent. over the first half of 1905; and of 120,116 oz., or 4.7 per cent. over the second half of last year.

EUROPE.

NORWAY.

A recent discovery of iron ore near Mosjoen, Norway, is claimed to be the highest grade ore yet found in that country, carrying over 60 per cent. iron, with low phosphorus and sulphur. The mine is only two miles from deep water. The owner, Mr. Elden, of Mosjoen, has a son, H. E. Elden, who is a resident of Milwaukee, Wis., and he has interested several Milwaukee parties in the mine.

SPAIN.

Exports of minerals from Spain for the four months ending April 30 are reported by the *Revista Minera* as below, in metric tons:

	1905.	1906.	Changes.
Iron ore	2,376,795	3,251,104	I. 874,309
Copper ore	335,827	394,290	I. 58,463
Zinc ore	44,681	54,724	I. 10,043
Lead ore	2,070	1,721	D. 349
Manganese ore	17,889	30,467	I. 12,578
Pyrites	210,689	341,191	I. 130,502
Salt	123 915	163,487	I. 39,572

Exports of metals were: Pig iron, 16,031 tons, against 24,407 tons in 1905; manufactured iron, 10,665 tons, against 670; copper precipitate, 7236 tons, against 5401; copper metal, 2945 tons, against 2678; spelter, 356 tons against 389; lead, 51,985 tons, against 48,284 tons last year.

Coal Trade Review.

NEW YORK, July 11.

The coal trade in the East shows no change anywhere, and is quiet as usual at this season.

In the West the process of settlement is nearly completed. Michigan and the Southwestern districts are the last to come into line, as shown below.

The final settlement in the Michigan district has been completed. Both parties agreed to the 1903 wage scale, but trouble was caused by the high initiation fee enforced by the miners, the operators claiming that many hundreds of coal miners were needed in the district in addition to those already employed, and that the initiation fee, then $50, prevented new miners coming into the district for work. The miners sought to remedy this by reducing the fee to $25, but the coal operators held out for a $10 fee. Finally President John Mitchell was called in and after several consultations with both parties he arranged a compromise settlement which was finally adopted by the miners and proved satisfactory to the operators. By the terms of this compromise the fee remains as fixed at $25, of which $10 is to be paid in cash and the balance divided into six equal payments of $2.50 each, one payment to be made at each pay-time.

President Cassatt, of the Pennsylvania Railroad Company, has issued a general order, directing all officers and employees of the company to dispose of all stock in coal companies, and of all interests in companies or firms operating coal mines on the lines of the road, or selling coal produced from such mines. This is the result of the investigation made into the recent charges against the management.

COAL TRAFFIC NOTES.

The coal trade and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to June 30 was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	2,359,843	2,085,135	D. 274,708
Bituminous	13,934,944	15,520,211	I. 1,585,267
Coke	5,480,985	6,294,691	I. 813,706
Total	21,775,772	23,900,037	I. 2,124,265

The shipments of anthracite coal in May were 5,704,037 long tons; a decrease of 140,015 tons, or 2.4 per cent., from May, 1905. Six companies showed decreases this year, and three gains; but the changes were not large. For the half year ending June 30 the shipments were as follows, by companies:

	1905. Tons.	1905. Per Ct.	1906. Tons.	1906. Per Ct.
Reading	6,187,544	20.1	5,154,323	20.3
Lehigh Vy	5,031,052	16.4	3,685,509	14.5
N. J. Central	3,922,054	12.8	3,155,226	12.4
Lackawanna	4,749,632	15.5	4,311,584	17.0
Del. & Hudson	2,939,882	9.6	2,576,072	10.1
Pennsylvania	2,507,932	8.2	2,172,258	8.6
Erie	3,142,581	10.2	2,612,368	10.3
N. Y., Ont. & W	1,447,642	4.7	1,086,182	4.3
Del., Sus. & Schu'l	788,678	2.5	632,279	2.5
Total	30,716,997	100.0	25,385,801	100.0

The shipments by months in 1906 have

been: January, 5,458,048 tons; February, 4,712,099; March, 5,745,868; April, 488,439; May, 3,276,310; June 5,705,037; total, six months, 25,385,801 tons. This is a decrease of 5,331,196 tons, or 17.4 per cent., as compared with the first half of 1905; due to the stoppage of mining in April and part of May.

New York. July 11.

ANTHRACITE.

The hard-coal market becomes still more lethargic as summer goes on. A few large line orders remain to be filled, and are calling for more or less steady shipments, but tidewater business is at a standstill. Most of the mines are working full time, except for a few days of last week, and if the light demand continues much longer, the mines will have to begin stocking.

Prices on the prepared sizes will remain throughout July as follows: $4.55 for broken and $4.80 for egg, stove and chestnut sizes. For steam sizes: $3 for pea; $2.25@2.50 for buckwheat; $1.45@1.50 for rice and $1.30@1.35 for barley f.o.b. New York harbor shipping points.

BITUMINOUS.

Atlantic seaboard soft-coal trade shows small improvements in some directions, but remains dull as before in others. Monthly allotments on contracts are not being lived up to by many consumers, and only a constant urging from the producers succeeds in getting any coal delivered. The light-draft discharging points seem to be taking on rather more than their allotments, but the deep-water ports, whither most of the coal goes, show the reverse. The inducement at the former ports is apparently low water freights, which, it is anticipated, will have advanced 25c. per ton by early fall, with the added difficulty of obtaining boats.

The strike in central Pennsylvania is still on, although it seems to be generally anticipated that the end of this month will find the men back at work. The total embargo at Port Reading is gradually being relieved, one producer after another being accorded the necessary facilities. The theory of the Philadelphia & Reading seems to be to make all suffer when only a few are to blame.

Trade in the far East is sporadic; coal is shipped only under protest. Shipments do not supply anywhere near the usual consumption, so that stocks are gradually being reduced. Trade along the Sound is quiet, and it is noticeable that all-rail shipments are taking some of the business at the points to which coal has heretofore gone by tide. This is the usual summer condition. Trade in New York harbor is quiet. Prices on good grades of steam coal range around $2.60@2.75, and West Virginia $2.40 f.o.b. New York harbor shipping points. All-rail trade is dull and consumers are not taking on enough coal to keep their stocks intact. Car supply is fair, and transportation is up to all demands.

Vessels in the coastwise market are not plentiful, and rates are firm. Current quotations from Philadelphia are: To Boston, Salem and Portland, 60@70c.; to the Sound, 50@55c.; To Lynn and Newburyport, 80@85c.; to Bath, 70c.; to Bangor, 80@85c.; to Saco and Gardiner, 90c. and towages.

Birmingham. July 9.

Several commercial coal operators are still without contracts with the United Mine Workers. Some of those who have signed announce that this will probably be the last year that they will deal with the union miners, having objections to the clauses providing two pay days a month, and also to mining rules. There has been a general resumption of work in the Alabama coal-fields.

J. F. Hanson, of the Central Railroad of Georgia, and the Pratt Consolidated Coal Company, of this district, have purchased the properties of the Gulf Coal and Coke Company, which concern controls thousand of acres of coal lands in Walker county. The Pratt Consolidated Coal Company, it is understood, will probably operate the property.

No change is announced in the situation as regards the furnace companies working union labor. The Alabama Consolidated Coal and Iron Company, and the Southern Steel Company are the only iron companies signing the union scale. An effort will be made this week to have a conference between the high officials of the Tennessee-Republic Company and the union leaders, but the prospects are not so very bright.

Chicago. July 10.

The local coal market is again back in the stage of dullness normal for the season. Supplies of all kinds of bituminous are coming in heavily and only a policy of restriction by producers will save the market from going to pieces. Anthracite, which showed a spurt in the closing days of July, so pronounced that it awakened hopes of a large summer business, is no longer in large demand; the sudden increase was apparently due to the June discount.

Both eastern and western coals are affected by the light demand for bituminous. The holiday has had the effect of diminishing production and has been beneficial slightly to the trade.

Prices continue low, Illinois and Indiana run-of-mine bringing $1.50@2.15, lump $1.80@2.50 and screenings $1.35@1.85. Fine coals, as usual, are in greatest demand for summer use. Hocking, through restriction of shipments, holds up to $3.15, circular price. Smokeless is firm, there being little demurrage coal, at $3.30 for run-of-mine. Youghiogheny has been in somewhat too great supply for the demand and the price is lower, being $2.75@3 for three-quarter.

Cleveland. July 10.

Most of the mines in the Middle district have resumed operations and are now shipping steam coal into this territory. The Hocking and No. 8 districts are about to resume operations, having compromised with their men. This will bring into activity all of the mines in Ohio affected by the strike, with the exception of the Massillon mines which will not compromise with their miners for some time. The mines which have resumed are running only to 50 per cent. of their capacity due to the shortage of labor, many of the men employed having obtained other positions during the suspension. The Pennsylvania mines, relieved from the burden of taking care of the strictly local demand, are shipping more of their coal up the lakes. The Middle district mines are supplying the local trade. Run-of-mine steam coal is selling at $1@1.05 at mines, with slack selling at 75@80c. at the mines. The strictly local supply will not be affected by the resumption of the Hocking district mines, since most of them are tied up with northwestern contracts which will engage their attention for some time. Lake three-quarter coal is still strong at $2.15 f.o.b. Lake Erie ports. Coke is strong, with the best grades of 72-hour foundry selling at $2.85@3 at the ovens, and furnace coke at $2.50@2.60 at the ovens.

Duluth. July 3.

New records are being made at the head of the lakes in handling coal. The largest coal cargo on Lake Superior this season was brought to Superior, June 26, by the "Joseph G. Butler," carrying 10,688 tons. It was followed by the "H. B. Smith," which brought 10,366 tons. The coal cargo record to the head of the lakes was made by the "A. B. Wolvin" when it came up last year loaded with 11,140 tons. In unloading the "Smith" at the Northwestern Fuel Company's dock, another record was also made in discharging a cargo of coal at this port. In 19 hours of actual working time, four hoists unloaded 10,366 tons, showing an average of 546 tons handled per hour.

Fort Smith, Ark. July 3.

All the miners in the Spadra and Russellville districts in Arkansas are in open rebellion against their organization, the United Mine Workers of America, because the recent agreement entered into between their organization and the operators is not just to their liking. The part of the agreement they particularly object to is the double standard system of paying for the coal. This was part of the 1903 scale, which was adopted. The State of Arkansas recently adopted a law requiring payment on run-of-mine coal; and in order to comply with the law, and still

retain the double standard of paying for the coal, it was necessary to adopt a clause providing for the weighing of the coal before and after screening, and to pay for the whole in proportion to the amount of lump coal it contains. This is called the sliding scale, and it is this to which the miners object, and on account of which several of the mines are still idle. Some of the companies complied with the law as above; while others, believing the law to be unconstitutional, made no change, and it was decided to make a test case with one of these. Hence Mr. Horace Whetzel, superintendent of the Bolen-Darnell Coal Company, operating at Hartford, Ark., was arrested and fined, and the case will be carried to the Supreme Court.

Indianapolis. July 9.

The miners of the Eleventh Indiana district will call a new convention. This was decided upon yesterday in a mass meeting held at Seeleyville. The object is to kill part of the recent joint contract. Another object of the convention is to ask the resignation of District President Wellington O'Connor and all of his staff. The movement for a new convention is gaining strength rapidly, and at least ten locals will be found signing the call for the convention. The case is the outcome of a grievance caused by the company trying to institute a system of leaving up top coal at the Rosebud mine. The officials were compelled to accede to the demands of the company, which claims that it was necessary to leave the top coal up in order to preserve the mine. The district officials called a meeting at once and discussed with the more conservative element the various clauses of the joint agreemnt. Two or three are open to more than one interpretation, and considerable misunderstanding has resulted during the past few weeks. District President O'Connor says many of the miners are unfamiliar with methods used in making contracts, and do not know how little the president has to do with making them. In the case of the last agreement the miner's convention accepted the proposed contract before it was taken before the joint convention. The miners' delegates voted to accept the scale, and it was taken to the joint convention, where it was officially accepted. It now remains to be seen if the opposition will be strong enough to break the contract and depose President O'Connor. The latter thinks that the movement is the work of a few men who aspire to notoriety, and that the affair will blow over in a few days.

Word comes from Washington that the Inter-state Commerce Commission is planning to investigate the relationship between railroads and coal mining in Indiana. Recently the commission has come into possession of information which leads it to believe that discrimination has been practiced by the railroads in this State.

The coal trade in Indiana is very good for this early in the season, and the demands are a little ahead of previous years. As old contracts expire, little effort is required to renew them at prices seemingly satisfactory to all parties concerned. Some difficulty is reported in southern Indiana, occasioned by Kentucky coal being put on the market at prices lower than Indiana coal can be mined.

Pittsburg. July 10.

Coal—The demand continues heavy, despite the fact that many mines in Ohio have resumed operations. The scarcity of railroad cars is interfering somewhat with shipments, but the supply is greatly improved over that of a week ago. Coal operators are complaining more of a scarcity of miners than a car shortage, and it is believed that more than 1000 men could obtain employment at the mines in the Pittsburg district. Prices are reported to be firm at $1.20 a ton for mine-run coal, although it is likely this rate could be shaded on a desirable order for future delivery.

Connellsville Coke—The demand for coke at the opening of the second half was greater than in any previous year, and prices are stronger. Furnace coke is quoted at $2.45@2.55 and foundry at $2.75@2.90 a ton. The production for the week, according to the *Courier*, was 272,432 tons. The shipment aggregated 14,725 cars, distributed as follows: To Pittsburg and river points, 4687 cars; to points west of Pittsburg, 8107 cars; to points east of Connellsville, 1931 cars. The production in the lower Connellsville region amounted to 104,901 tons.

Foreign Coal Trade.

July 11.

Messrs. Barrington & Holt write from Cartagena, Spain, under date of June 23: An interesting feature in the local trade is the recent introduction of Scotch steam coal. Until lately the only coal imported has been Newcastle and Cardiff, with a few odd cargoes from America and Germany. Wm. B. Cowan & Kinghorn, of Glasgow, have secured several contracts for the supply of Scotch coal, with satisfactory results.

Spain has never taken any American coal, probably because the United States takes little iron ore; only an occasional cargo coming to Philadelphia or Baltimore. It was proposed some time ago to send Nova Scotia coal there, the vessels loading iron ore for the return voyage; but the plan does not seem to have worked out well. British coal goes to Spain, because there is always plenty of tonnage going after iron ore.

Iron Trade Review.

NEW YORK, July 11.

The iron and steel trades are unusually active for this period of the year. The midsummer dullness, which we generally expect in July, is not apparent to any extent. The July stops for repairs in most mills are being cut down as much as possible, and in some cases omitted altogether. A result of this condition is found in the complaints of shortage of labor, which are heard from several quarters, chiefly in Pennsylvania.

Almost the only point in the market where comparative quiet prevails is in foundry iron. The molders' strike is still troublesome, and may become more so. It is said that the union is preparing to make a decisive stand in the Pittsburg district. Sheets, which have been rather quiet, show a reviving demand.

A statement prepared by the American Iron and Steel Association shows the proportion of iron and steel products of the United States Steel Corporation to the total output of the country as below, in percentages:

	1904.	1905.	Changes.
Pig iron	44.3	43.8	D. 0.5
Spiegel and ferro	70.5	74.9	I. 4.4
Bessemer ingots	69.0	67.4	D. 1.6
Open-hearth ingots	50.4	51.4	I. 1.0
Total steel	61.0	60.2	D. 0.8
Bessemer steel rails	57.2	53.6	D. 3.6
Structural shapes	55.1	54.6	D. 0.5
Plates and sheets	58.0	57.4	D. 0.6
Wire-rods	71.3	69.9	D. 1.4
Other rolled products	28.6	31.0	I. 2.4
All rolled products	47.8	47.3	D. 0.5
Wire nails	67.0	66.1	D. 0.9

In most products the corporation fell a little behind the general gain. Its weak side is still in pig iron; though it must be remembered that, through its command of ore, it is able to make advantageous deals with many outside blast furnaces.

Birmingham. July 9.

Southern pig-iron manufacturers continue to sell their product right along, the new price bringing some large consumers into the market. While there are rumors still heard that the smaller manufacturers are offering their iron under $13.50, very little, if any, iron can be discovered going out from this section at $13 or $13.25. Producers state that they have covered well the probable make for the third quarter of the year, and some selling has been done for delivery after Oct. 1.

The foundries are working nicely in this district, considering the season of the year. The cast-iron pipe makers are urging the largest possible production. The output at these plants is large and steady. At Ensley and Gadsden the steel output is satisfactory. The Southern Steel Company expects to be able to resume operations at its iron-blast furnace at Gadsden within 30 days. This company is now receiving basic iron from the Alabama Consolidated Coal and Iron Company for its steel plant.

The Woodward Iron Company has started the work of rebuilding one of its Woodward furnaces. A lot of foreign labor was brought in recently by this company.

Chicago. July 10.

The local market continues unusually active for pig iron. Sales in the last week probably aggregated two to three times the usual total for a week at this season of the year. Most of the buying continues to be in small lots for piecing out the requirements of foundries, but the making of contracts for future supplies is increasing. Most melters are satisfied to engage enough iron for the remaining months of the year. Prices are strong, if not a little firmer than last week. Southern No. 2 is sold closely about $13.50 Birmingham ($17.40 Chicago). Northern brings $18@18.25 and is scarce. Northern charcoal is in very good demand at $19, and the supply is not heavy.

Coke is in somewhat greater demand owing to the increasing activity in the iron market, but supplies are plentiful with no significant change in prices.

Cleveland. July 9.

Iron Ore—The June shipments of iron ore from the head of the lakes were 5,489,256 tons, compared with 4,999,450 tons for June, 1905. The shipments to July 1 were 11,241,596 tons, compared with 10,814,054 tons for the corresponding period of 1905. The shipments were somewhat disappointing, owing to the shortage of labor in the mining regions, which is not likely to be relieved during the remainder of the summer. Regardless of this, however, shippers predict a movement of 5,800,000 tons for July. High-grade ore is still in demand at a premium, but none is for sale. Lake rates are steady at 75c. from Duluth as a basis. The despatch to boats at lower lake ports is poor.

Pig Iron—The foundry market is quiet just now. Spot iron is coming mostly from outside of this territory, except where off irons of higher grade are sold to meet the demand. The price is $17 for No. 2 in the Valleys. Southern iron is being sold freely in this territory at $13.50, Birmingham, for No. 2. Basic is strong and scarce at $17 in the Valleys and bessemer is scarce and steady at $17.25@17.50 in the Valleys.

Finished Material—Bar-iron mills have been closed down for a week, but many of them are forced to resume activity to meet the demands of the trade. Iron is strong at 1.50c. nominally, Pittsburg. Sheet mills have been closed also, but are compelled to resume for the same reason. This complicates the billet and sheet-bar situation, increasing the shortage in those lines.

New York. July 11.

Pig Iron—The first part of the week was rather dull, but yesterday some large inquiries were received, which look like business. Northern furnaces are pretty well sold up, and a number are out of the market. The Southern furnaces have unloaded their surplus iron, and are holding now at $13.50, Birmingham, for No. 2 foundry, which is equal to $17.50, New York.

Current quotations for pig iron are, for New York or parallel delivery:

Northern:	
No. 1 X foundry	$18.50@$19
No. 2 X foundry	17.75@18.50
No. 2 plain	17.25@17.75
Forge pig	16@16.50
Southern:	
No. 1 foundry	17.50@18
No. 2 foundry	17@17.50
No. 3 foundry	16.60@16.75
No. 4 foundry	15.50@16
No. 1 soft	17.50@18
No. 2 soft	17@17.50
Gray forge	15@15.50
Basic pig:	
Northern	17.50@17.75
Virginia	17.60
Alabama	17.75@18.25

City or local deliveries are not included in prices, which are for large lots, on dock or cars.

Bars—Bar iron has sold better, and prices are unchanged, at 1.545@1.645c., tidewater. Steel bars are quoted 1.645c. Store trade is fair, at 1.75c. delivered.

Plates—Tank plates are quoted 1.745@1.825c., tidewater, according to width. Flange and boiler are 1.845, and fire-box 2.045c. Jobbers ask higher prices for small lots.

Structural Material—Prices are nominally unchanged. Beams under 15 in. are 1.845c. for large lots; over 15 in., 1.895c.; angle and channels, 1.845c., tidewater delivery. A large part of the business here is done by jobbers, who are asking 2.50c. for beams and channels out of stock. Business has been a little quieter.

Old Material—The scrap market is dull and dealers are willing to listen to talk of concessions. The only special demand is for heavy steel melting scrap, which is firm.

Philadelphia. July 11.

The sudden expansion of demand for pig iron has taken the trade somewhat by surprise. The weakness of June quotations has been followed by a hardening of prices in July which promises to keep at the present level for an indefinite period. The inclination among some of our furnace makers is to book orders slowly and to take their choice among buyers. They look for a strong market for some time to come. Quotations may be given at $19.25 for No. 1 X foundry; $18.50 for No. 2; $17.50 for No. 2 plain; $16@16.25 for gray forge; $17.50 for basic; $20 for bessemer, which is nominal, and $21.50 for some lots of Lake Superior charcoal.

Steel Billets—The consumers of steel billets are shouldering each other out of the way to obtain acceptance of orders for billets for which they are glad to pay $29. Forging steel runs as high as $33.

Bars—Quite a number of mills are idle, but there will be a general resumption at an early day. The bar-iron situation has been strengthened by the placing of some heavy orders by the car builders.

Sheets—The sheet situation is practically unchanged. The mills are all oversold and they are straining points to keep their larger customers promptly supplied.

Pipes and Tubes—The pipe quotations hold up to June levels and tubes are very active at firm prices.

Scrap—There is nothing to report. The scrap men have gathered a great deal of stuff in their yards and they have options on a good deal of scrap that is lying around loose.

Pittsburg. July 10.

There is but little bessemer iron available for delivery before Oct. 1, the sale of 10,000 tons to the United States Steel Corporation by the Bessemer Pig Iron Association for September having practically cleaned up all that interest has to offer for this quarter. The only concern that has any unsold bessemer is W. P. Snyder & Co., and its supply is said to be limited. Foundry and gray forge continue to be the weak grades of pig iron, although there has been a firmer price for foundry during the past few days. The threatened wage trouble with the iron molders has not developed and foundries are only buying for immediate requirements. As there is a large supply, no difficulty is had in getting all that is desired at the prevailing low prices. It is understood the Steel Corporation is in the market for bessemer iron for August delivery, and if it fails to get the tonnage required, will buy heavy melting scrap. All of the steel mills of the Carnegie company in this district are in full operation and closed only for one day on account of the Fourth of July. Some of the other corporation plants were forced to close for a longer period for repairs, but all are expected to be running again on July 16. All the blast furnaces of the Steel Corporation in Pittsburg and Valley districts are in operation and will continue running steadily, as all are well supplied with bessemer ore.

This is a dull period in the steel market and but little new business has been booked in any line. According to custom the wire mills have entered into an agreement to curtail production during July and August about 30 per cent., and as a result prices are firmly maintained. There has been no weakening of prices in any finished line, and in some, notably plates and shapes, prices are stronger. The demand for sheets and tin-plate is very heavy and independent interests that closed their plants on June 30, refusing to sign the wage scale of the Amalgamated Association of Iron, Steel and Tin Workers, are preparing to resume. The Youngstown Sheet and Tube Company, of Youngstown, and Zug & Company, Pittsburg, large independent producers, have already signed and the rest are expected to do so before the end of the week. The American Sheet and Tin Plate Company is preparing to put its Monongahela tin-

plate works, in Pittsburg, in operation next Monday. This plant has been idle all year.

Pig Iron—Sales of pig iron during the week did not exceed 5000 tons. Bessemer is firm at $17.75, Valley furnaces, for all deliveries, and basic is quoted at $17.25@17.50, Valley. Foundry iron continues weak, but quotations are higher, $16.25@16.50, Valley, being named. Gray forge remains at $16@16.50 Pittsburg.

Steel—Billets are still scarce; it is almost impossible to buy bessemer billets at $27.50, and open-hearth are quoted at $28. Sales of sheet bars have been made at $29, Pittsburg, and the Republic Iron and Steel Company made some sales for delivery at Valley points at $29.50. Plates remain at 1.60c. and merchant steel bars at 1.50c.

Sheets—The demand for sheets is unusually heavy and some mills are unable to guarantee delivery on certain sizes before October. There is no difficulty in maintaining the new prices established last month by the leading interest. Black sheets are strong at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—The market is strong at the recent advance; $90@95 is still quoted for July delivery and $85 a ton for the rest of the third quarter.

Cartagena, Spain. June 23.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 3600 tons Colorado ore, and one cargo, 2400 tons manganiferous ore, to Great Britain; one cargo, 5700 tons dry ore, and one cargo, 6000 tons Calasparra magnetic, to Rotterdam; 10 tons specular ore to Amsterdam. Everyone connected with trade is busy, and the port is full of vessels waiting their turns to load.

Quotations have been advanced, and are now 8s. 9d. @ 9s. for ordinary 50 per cent. ore; 9s. 3d. @ 9s. 6d. for special low phosphorus ore; 12s. 1d. for specular ore, 58 per cent.; 10s. 6d. for S. P. Campanil. Manganiferous ores range from 11s. 10d. for 35 per cent. iron and 12 manganese up to 18s. 3d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 10s. 8d. per ton, f.o.b. shipping port. Exports for the week were 220 tons to France.

Chemicals.

NEW YORK, July 11.

Copper Sulphate—Recent demand has been good, and supply is hardly up to requirements. The market is steady. Prices range from $6 per 100 lb. for carload lots for future shipment, up to $6.30 for smaller lots for spot or near deliveries.

Nitrate of Soda—Mortimer & Wisner, of New York, give the statistics for this country on July 1, as follows, in long tons:

	1905.	1906.	Changes.
Stock, Jan. 1	8,380	13,100	I. 4,720
Imports, Atlantic ports	116,700	153,680	I. 36,980
Supplies	125,080	166,780	I. 41,700
Deliveries, six months	122,480	154,955	I. 32,475
Stock, July 1	2,600	11,825	I. 9 225
Afloat, July 1	100,000	80,000	D. 20,000
Visible stocks	102,600	91,825	D. 10,775

Stocks afloat include all due to arrive at Atlantic ports by Oct. 15. Imports are all from the west coast of South America.

Future quotations are 2.30c. for 96 per cent. Spot or short deliveries are 2.40c. for 96 per cent., and 2.32½c. for 95 per cent.

Metal Market.

New York, July 11.

Gold and Silver Exports and Imports.

At all United States Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1906	$5 716,898	$33,950,671	Imp. $28,233,773
" 1905	481,570	2 657 143	" 2,175,573
Year 1906	28,349,072	59,239,334	" 30,890,262
" 1905	35,800.708	14,460,402	Exp. 21,340,396
Silver:			
May 1906	5,544,546	4,370,788	Exp. 1,173,758
" 1905	5,426,590	3,742,113	" 1,684,477
Year 1906	28,923,841	19.844,412	" 9,079,429
" 1905	20,326,631	11,817,345	" 8,509,286

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending July 7, and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$151,000	$ 148,620	$ 991,797	$ 43,448
1906	5,889,021	44,915,254	31,995,762	1,105,662
1905	37,912,098	635,085	16,658 324	1,902,933
1904	63,679,962	3 563 629	21,291,094	471,564

Imports for the week, both gold and silver, were from Mexico and Central America. Exports of gold were to Mexico; of silver, chiefly to London.

A total of $2,500,000 gold has been engaged in Australia for shipment to the United States, and it is understood that more will be secured there. Last year practically no gold came here from Australia; but in 1903 and 1902 there was a considerable movement.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending July 7 gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts	$1,116,458,500	$1,050,578,100
Deposits	1,158,305,100	1,036,343,700
Circulation	48,858,900	48,435,600
Specie	210,971,300	181,281,000
Legal tenders	86,562,800	84,270,000
Total Reserve	$297,534,100	$265,551,000
Legal requirements	289,576,275	259,085,925
Surplus reserve	$7,957,825	$6,465,075

Changes for the week this year were increases of $13,273,300 in deposits and $73,200 in circulation; decreases of $6,366,800 in loans, $5,903,500 in specie, $3,005,500 in legal tenders and $5,590,675 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world:

	Gold.	Silver.	Total.
New York	.....	.....	$181,281,000
England	$183,997,545	.....	183,997,045
France	592,652,570	$214,520,220	807,172,790
Germany	158,335,000	52,775,000	211,110,000
Spain	75,770,000	124,425,000	200,195,000
Netherlands	27,603,500	29,073,500	56,677,000
Belgium	19,400 000	9,700,000	29,100,000
Italy	146,195,000	19,974,000	166,169,000
Russia	542,260,000	29,505,000	571,765,000
Austria	233,545,000	63,320,000	296,865,000
Sweden	19,375,000	.....	19,375,000

The returns of the associated banks of New York are of date of July 7, and the others July 6. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to June 21:

	1905.	1906.	Changes.
India	£ 3,544,741	£ 9,400,263	I. £ 5,855,522
China	638 396	.....	D. 638.396
Straits	2,800	1,750	D. 1,050
Total	£ 4,185,937	£ 9,402,013	I. £ 5,216,076

Imports for the week were £8000 from South America, £264,000 in bars and £100,000 in Mexican dollars from New York; a total of £372,000. The exports were £310,000 in bars and £26,300 in Mexican dollars; a total of £336,300, all to India.

Indian exchange continues steady, although money is reported plentiful in India. The Council bills offered in London were taken at an average of 16d. per rupee. Shipments of silver to India continue large.

The Treasury Department's estimate of the amount and kinds of money in the United States on July 1 is as follows:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$242,734,343	$ 673,327,609
Gold certificates	41,686,900	518,092,969
Silver dollars	6,318.528	77,073,327
Silver certificates	5,508,403	471,964,597
Subsidiary silver	6,596,920	111,401,668
Treasury notes of 1890	47,402	7,338,598
U. S. notes	10,279,562	336,401,454
Nat. Bank notes	12,228,752	548,883,608
Total	$325,400,810	$2,744,483,830

Population of the United States, July 1, 1906, estimated at 84,662,000; circulation per capita, $32.42. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. The statement of money held in the Treasury assets of the Government does not include deposits of public money in national bank depositaries to the credit of the Treasurer of the United States, amounting to $84,736,336. The amount in circulation on July 1 shows an increase of $802,710 over June 1, and an increase of $147,767,359 over July 1 of last year.

Bazaars have been the principal buyers of silver during the last few days. Supplies have been adequate to meet the inquiry and prices have been fairly steady.

During May royalty was paid at the office of the comptroller, Dawson, on gold valued at nearly $960,000, which was the highest value entered for royalty payments in any corresponding month since 1903. The values of gold so entered in May of three years was as follows: 1904, $836,606; 1905, $485,603; 1906, $959,422. It is estimated that a similar increase over last year will be maintained. The present season opened early.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.50¼	$0.52
Peruvian soles and Chilean	0.46¾	0.49¼
Victoria sovereigns	4.85⅛	4.87⅛
Twenty francs	3.86	3.89
Spanish 25 pesetas	4.78	4.80

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
5	4.84⅜	64⅞	29 1/16	9	4.84½	64¾	29 1/16
6	4.84⅜	64⅝	29 1/16	10	4.84⅛	65	30 1/16
7	4.84⅜	64⅞	30	11	4.84⅛	65⅛	30⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals.

Daily Prices of Metals in New York.

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
5	18⅛ @18⅜	18⅛ @18⅜	81⅛	38¾	5.75	5.97½ @6.00	5.82½ @5.85
6	18⅛ @18⅜	18⅛ @18⅜	81⅛	37¾	5.75	5.97½ @6.00	5.82½ @5.85
7	18⅛ @18⅜	18⅛ @18⅜	....	37¾	5.75	5.97½ @6.00	5.82½ @5.85
9	18⅛ @18⅜	18 @18⅛	81 1/16	37⅛	5.75	5.97½ @6.00	5.82½ @5.85
10	18⅛ @18⅜	18 @18⅛	81 1/16	37⅛	5.75	5.97½ @6.00	5.82½ @5.85
11	18⅛ @18⅜	18 @18⅛	80⅛	36	5.75	5.97½ @6.00	5.82½ @5.85

London quotations are per long ton (2,240 lb) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper—Reports from domestic manufacturers indicate no falling off in their activity, but they are not in the market for copper, and the latter is dull. During the past week sellers have held out inducements to bring about business. Consumers, however, are covered and apparently are not yet inclined to anticipate their requirements. Some sales have been made for export, at lower prices. The quotations at the close are 18½@18⅝ for Lake copper; 18@18¼ for electrolytic in ingots, cakes and wirebars; 17⅞@18⅛ for casting copper.

The standard market in London has also displayed a sagging tendency. The holders of warrants have availed themselves of every opportunity to unload, but have not been able to do so without bringing about a substantial decline in the quotations. The close is cabled at £80 10s. for spot, £79 15s. for three months.

Refined and manufactured sorts we quote: English tough, £85 10s.@£86 10s.; best selected, £86@£87; strong sheets, £94.

Exports of copper from New York for the week were 2960 long tons. Our special correspondent reports the exports from Baltimore for the week at 1298 long tons.

Tin—Prices in London have had a sharp break, and the market both there and in this country is utterly demoralized. Consumers are holding off pending further developments. The close in London is cabled at £165 for spot, £163 5s. for three months. The market here is nominal, being quoted at 35⅞@36⅛, depending upon deliveries.

Lead is very quiet but steady at last quotations.

Prices in London have given way materially and close at £16 6s. 3d. for Spanish lead, £16 8s. 9d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on July 11 as follows: Lead is dull and the latest sales are on a basis of 5.72½c. for Missouri brands.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 23, that silver has been 13.25 reales per ounce. Exchange has been 27.85 pesetas to £1. Pig lead is 77 reales per quintal; equal on current exchange to £15 12s. per long ton, f.o.b. Cartagena. Exports were 50 tons desilverized to Genoa; 100 tons desilverized to Marseilles; 1013 tons argentiferous lead to London.

Spelter—The lower prices have attracted the attention of consumers, and a fair amount of business has been done. The close is steady at 5.82½@5.85 St. Louis, 5.97½@6c. New York.

The London market is easy, the quotations at the close being cabled at £26 15s. for good ordinaries, £27 for specials.

St. Louis Spelter Market—The John Wahl Commission Company telegraphs us on July 11 as follows: Spelter is quiet, but firm, at the late decline. Latest sales here are on a basis of 5.87½c., East St. Louis.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 23, that the market remains quiet, owing to the advance in exchange, and the failure of buyers and sellers to agree on prices.

Zinc Sheets—The price of zinc sheets is $7.75 per 100 lb. (less discount of 8 per cent.) f.o.b. cars for Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since Jan. 1, 1906, have been small, the highest price having been $8 on Jan. 6, the lowest $7.65 on May 18.

Antimony is altogether neglected. Prices are nominal at last quotations, Cookson's and Halletts at 25@26c.; other brands 23@24c. per pound.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producers, are 40@45c. per lb. for large orders, according to size of order and terms. For small lots, 50@65c. is charged.

Platinum—Demand is strong and steady. Prices are unchanged, $26 per ounce in New York. From $20 to $23 per ounce is paid for scrap platinum.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to about $43 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is £7 7s. 6d. per flask, but jobbers ask £7 10s. for moderate lots.

Aluminum—The July circular of the chief producer shows an advance of 1c. per lb. on all goods. List prices are as follows: No. 1, over 99 per cent. pure, in ingots, 39c. per lb. in lots less than 100 lb.; 37c. in lots over 100 lb. and up to 1 ton; 36c. in ton lots or over; No. 2, over 90 per cent., 36c., 35c. and 34c., in lots as above. Granulated metal is 2c. per lb. over price of ingots; rods, 1c. per lb. over ingots. Rolled sheets are 45c. per lb. up, according to size.

Missouri Ore Market.

JOPLIN, July 7.

The highest price reported paid for zinc was $48 per ton for one bin of ore, the assay basis ranging down from $45 to $42 per ton of 60 per cent. zinc. The average price was $43.98.

The highest price reported paid for lead was $76 per ton, and the average price was $75.22.

The Fourth of July closing of the mines reduced the output approximately one-fourth, and purchasing was correspondingly light, the shipment marking very

closely the output of the week. With a stock of 3500 tons on hand and several of the buyers out of the market, the remaining ones succeeded in pounding down prices toward the close of the week, causing a decline of $2 per ton. A further decline is predicted for the following week; it seems to be the intent to put the price back down to a $40 basis. Nearly the entire shipment of lead went to the St. Louis Smelting and Refining Company, as its buyers paid $78 per ton for the bulk of the ore purchased. Two of the local smelters purchased very lightly, while the Picher Lead Company secured a small proportion, because its buyers were offering only $72 at the close of the week.

Following are the shipments of zinc and lead from the various camps of the Joplin district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,449,290	229,500	$56,000
Carterville-Webb City	1,347,190	447,310	46,188
Galena-Empire	725,290	135,970	20,344
Duenweg	329,450	220,830	15,417
Alba	525,100	10,840	12,477
Aurora	516,560	65,620	11,790
Badger	301,310	.....	7,230
Prosperity	38,480	156,670	6,642
Neck City	279,990	.....	6,439
Granby	313,000	25,000	5,800
Baxter Springs	185,370	54,640	5,727
Oronogo	193,120	2,560	4,381
Sherwood	117,410	19,620	3,425
Spurgeon	135,350	12,330	3,150
Zincite	97,260	1,170	2,280
Carthage	39,980	.....	919
Totals	7,594,150	1,382,060	$218,209
27 weeks	278,615,590	38,916,150	$7,518,291

Zinc value, the week, $167,010; 27 weeks, $6,032,507.
Lead value, the week, 51,199; 27 weeks, 1,485,784.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.88
March	47.40	42.68	March	57.20	73.72
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58 27	78.40
June	40.75	43.83	June	57.80	80.96
July	43.00	....	July	58.00	..
August	48.83	....	August	58.00	....
September	46.75	....	September	63.50	....
October	47.60	....	October	63.86	....
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Wisconsin Ore Market.

PLATTEVILLE, July 7.

Weakness has ruled in the zinc ore market. It is reported that the Mineral Point Zinc Company intends to go out of the market temporarily, pending the completion of the DePue works. There is now piled up at Mineral Point some 3000 or 4000 tons of high-grade zinc ore awaiting shipment to the new smelter.

The Empire roasted ore sold readily at top price. The price of ore ranged from $30 to $47 with $43.50 as a 60 per cent. basis. Early selling was the rule, so as to get cleared up before the Fourth, which was observed generally throughout the district, a majority of the mills closing down July 3 and not resuming till July 6. Some increased activity was observed among the buyers the latter part of the week, when it was learned that there would be a shortage in the week's output as compared with last week. From $33.50 to $37.50 per thousand was offered for lead. Drybone ranged from $5 to $18. Sulphur sold at $3@6 per ton.

The camps of the Platteville district loaded ore as follows for the week:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	233,570	.....	.....
Cuba City	189,030	.....	.....
Linden	119,320	.....	.....
Galena	114,700	.....	.....
Mineral Point	80,030	33,320	.....
Benton	60,000	.....	.....
Hazel Green-Buncombe	59,500	.....	.....
Montfort	.....	.....	125,000
Total for week	856,150	33,320	125,000
Year to July 7	34,490,850	1,903,390	3,324,980

Because of the exceptionally favorable conditions for outside operations, the month of July has seen so far a good amount of gain in the way of new workings. It is expected that by the end of the month, if the favorable conditions continue, the output from the Hazel Green camp will equal that of any of the large producers.

Mining Stocks.

NEW YORK, July 11.

Hot weather has had an effect on the market, and there has been little outside dealing. The business has been largely professional, and there has been dull trading, with declines, varied by fractional recoveries.

Amalgamated Copper sold down to $98, recovering to $99; American Smelting and Refining common closed at $145, after selling at $144. Ontario, of Utah, was dealt in at $2.50. The Southern iron stocks are again quiet; Tennessee Coal, Iron and Railroad sold at $141, recovering to $142.50 at the close.

The curb market was heavy, in sympathy with the Exchange, and mining stocks were dull for the most part. Tonopah Extension broke badly over rumors of trouble between the Schwab and McKane interests, but recovered from $5.50 to $7 on contradiction of these reports. There was some dealing in the rights to take the new Guggenheim Exploration stock, sales being made as high as $13. Nipissing Mines closed at $5.25; Greene Consolidated Copper weakened to $21.50, on heavy selling pressure.

On the Consolidated Exchange dealing in mining stocks was light. In the Comstock shares, sales were made of Ophir at $3.65; Hale & Norcross at 88c. In the Tonopah, $1.20 was paid for Jim Butler, and 48c. for Bullfrog National Bank.

Boston. July 10.

It has been a quiet week in the mining-share market, and outside of the persistent selling of Greene Consolidated and the $4 drop in Allonez mining, the market has been featureless. Shannon might be considered an exception, as it has advanced $1.25 to $9.50 on heavy trading the past day or two. New interests have appeared in this property, and there is likelihood of changes at the annual meeting in the fall, which will return the company's headquarters to Boston. The selling of Greene, which is off $4 for the week to $20, has come largely from New York, although the decline has brought some local unloading. Considerable dissatisfaction is expressed at the present management.

Allonez's break to $32 came as a result of the abandonment of No. 2 shaft, which is down but 90 ft. The inflow of water has been such, and work was so handicapped by quicksand, etc., that the directors took this action Monday, and decided to start a test shaft 600 ft. nearer No. 1, where surface conditions are more favorable. This will permit a connection with No. 1 much quicker. The action, however, will not interfere with the present productions.

Sentiment as a whole is much more confident regarding copper shares, and the New York stock tax is expected to benefit this market, especially the curb. Amalgamated, which advanced $3 to par, is off again to below $98. Copper Range rose $2 to $71.25, but lost most of it. Bingham spurted $2.50 to $30, but lost $1 of it, and Boston Consolidated rose $1 to $26, losing one-half of it. Osceola is the same as a week ago at $102, ex the $6 dividend.

United Copper spurted $2.50 to $66, but lost $1 of it, and Utah Consolidated advanced $1.75 to $55.75, reacting $1.

On the curb, Raven touched 50c., but subsequently rose to $1. This stock sold at $8 in the spring. There has been a deal of juggling with the stocks, to say the least. Arizona Commercial is off $6 to $35 on the curb.

Colorado Springs. July 6.

The past week has been probably the most active of any this year, and the sales for one day reached 200,000 shares. Prices in a great many instances have scored advances, and predictions are that the market is good for still further gains.

The total output of the Cripple Creek district for the month of June amounted to $1,608,800, which is considered high for this month of the year. Many good strikes have been reported in different parts of the camp.

San Francisco. July 5.

There has been little or no business this week, as the exchange adjourned over from Saturday, June 30, to today, Thursday. The Comstock companies have their business so far adjusted that they have brought out a new crop of assessments, some 15 having been ordered this week. The market today, after the holiday, was quiet and rather weak.

New Dividends.

Company.	Payable.	Rate.	Amt.
Bunker Hill & Sullivan	July 5	$0 60	$ 80,000
Bullion Beck & Champion	July 2	0.10	10 000
Dominion Coal, pf	Aug. 2	3 50	105.000
Harbison-Walker, Ref., pf.	July 20	1.50	144,000
Hecla, Idaho	July 20	0.06	60,000
Portland, Colo	July 6	0.05	150,000
Tonopah Belmont	June 21	0.10	129,501

Assessments.

Company.	Delinq.	Sale.	Amt.
Belcher, Nev	July 18	Aug. 8	$0.10
Bullion, Nev	July 10	Aug. 1	0.05
Chollar, Nev	July 10	July 30	0.10
Con. Cal. & Va	July 9	July 30	0.25
Exchequer, Nev	July 11	Aug. 1	0.05
Justice, Nev	July 11	Aug. 2	0.05
Mexican, Nev	July 10	July 31	0.15
Old Col. & Eureka, Utah	July 26	Aug. 13	0.001
Overman, Nev	July 13	Aug. 3	0.10
Potosi, Nev	July 16	Aug. 6	0.10
Quincy Junior, Utah	July 25	Aug. 15	0.10
Sierra Nevada	July 10	Aug. 1	0.10
Scorpion, Nev	July 10	July 31	0.02
Utah, Nev	July 18	Aug. 8	0.05

Tonopah Stocks July 11

(Revised by Weir Bros. & Co., New York.)

	High.	Low.	Last.
Tonopah Mine of Nevada	19.50	19.50	19.50
Tonopah Montana	2 85	2.82	2.83
Tonopah Extension	7 25	6.87½	6.87½
Tonopah Midway	2.20	2.18	2.20
Tonopah West End	2.45	2.45	2.45
Goldfield Mining Co.	.40	.39	.40
Jumbo Mining	1.24	1.22	1.23
Red Top	1.26	1.24	1.25
Sandstorm	.59	.57	.58
Montgomery Shoshone Cons	14.50	14.25	14.37½
Eclipse-Bullfrog	....	....	....
Denver-Bullfrog	...	...	....

St. Louis. July 7.

Adams, $0.40—$0.25; American Nettie, $0.15—$0.12; Center Creek, $2.80—$2.20; Central Coal and Coke, $65 00—$60.25; Central Coal and Coke, pfd., $80.00—$79.00; Central Oil, $60.00—$55 00; Columbia, $5.00—$2.00; Con. Coal, $22.00—$17.50; Doe Run (old stock), $350.00—$300.00; Granite Bimetalic, $0.25—$0.20; St. Joe (old stock), $32.00—$30.00.

LONDON. (*By Cable.*) July 11.

Dolores, £2 0s. 0d.; Stratton's Independence, £0 4s. 0d.; Camp Bird, £1 4s. 3d.; Esperanza, £3 18s. 9d.; Tomboy, £1 6s. 3d.; El Oro, £1 5s. 8d.; Oroville, £0 17s. 6d.; Somera, £0 3s. 9d.; Utah Apex, £1 3s. 2d.

*Furnished by Hayden, Stone & Co., New York.

COLORADO SPRINGS. July 7.

Name of Company.	High	Low	Clg	Sales
Acacia	15	14	14	44,000
C. C. Con	4⅞	4⅞	4⅞	....
Doctor Jack Pot	9	8	8¾	53,000
Elkton	46¾	43½	46¾	52,000
El Paso	43	42	42½	6,100
Findley	76	75	76	7,000
Gold Dollar	8¾	7¾	8¼	17,000
Gold Sovereign	5⅞	5½	5½	....
Isabella	24¼	23	23	11,500
Jennie Sample	11⅛	10½	11½	172,100
Mary McKinney	49⅜	49	49⅜	2,750
Portland	1.50	1.48	1.50	6,600
United Gold Mines	10	9¾	9¾	....
Vindicator	93	93	93	....
Work	13	11½	13	50,300

SAN FRANCISCO. July 5.

Name of Company.	High	Low	Clg	Sales
Best & Belcher	.70	.70	.70	100
Caledonia	.33	.31	.33	1,000
Chollar	.10	.07	.07	
Con. Cal. & Va	.70	.66	.67	3 850
Crown Point	.11	.11	.11	
Gould & Curry	.11	11	.11	800
Hale & Norcross	.90	.90	.90	100
Mexican	.59	.55	.57	500
Ophir	3.75	3.60	3.70	1,150
Overman	.06	.05	.06	1,300
Potosi	.05	.05	.05	500
Savage	.76	.75	.76	400
Sierra Nevada	.15	.14	.15	900
Standard Con.	2.00	2.00	2.00	
Bullfrog Mining	.38	.37	.38	2 500
Diamondfield	.40	.35	.37	50 700
Jim Butler	1.25	1.22½	1.22½	1,600
Kendall	.55	.55	.55	500
MacNamara	.79	.76	.79	7,300
Manhattan Dexter	.48	.47	.47	5,600
North Star	.50	.46	.48	9 800
Original Bullfrog	.14	.14	.14	9,500
Tonopah Belmont	5.62½	5.50	5.50	200

STOCK QUOTATIONS.

NEW YORK. Week July 10

Name of Company.	High	Low	Clg.	Sales
Amalgamated	100⅛	95⅜	97⅜	396,435
Anaconda*	241⅛	230	231⅝	124,400
British Col. Copper	7⅛	6¾	7⅛	3.025
Butte Coalition	30	28	29½	1 060
Cum. Ely Mining	7½	6¾	7	13,200
Greene Gold	2⅞	2¾	2⅝	4,900
Greene Gold & Silver	1⅞	1½	1⅝	4,710
Guanajuato	5⅜	5	5	3,000
Micmac	4⅛	3½	4	6.565
Mines Co. of Am	1.27	1.23	1.23	4 500
Mitchell Mining	6⅛	5⅜	5⅜	9,925
Mont. Sho. Con. (New)	15⅜	13¾	14⅜	1,100
Nev. Utah M. & S.	3⅛	2⅞	2⅞	10,150
Nipissing Mines	5⅜	5	5½	17,450
Tennessee Copper	43	39½	42½	1,850
Union Copper	1⅛	1⅛	1⅛	800
Utah Apex	5½	5¼	5⅜	1 970

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	146⅛	141½	144⅛	153,450
Am. Smelt. & Ref., Pf.	118⅜	114⅛	117	4,200
Bethlehem Steel	26½	26	26	
Colo. Fuel & Iron	50⅝	45½	49¼	92,350
Federal M. & S., Pf.*	93½	91	92⅜	1,310
Inter. Salt	34	31½	34	450
National Lead	75¼	71⅝	74¼	17,650
National Lead, Pf	101	100¼	101	800
Pittsburg Coal	14	13½	14	800
Republic I. & S.	27	25	26	5,300
Republic I. & S., Pf.	96¼	94	95	4,100
Sloss-Sheffield	72½	69	70¾	6.000
Tenn. C. & I*	146	140½	142	5,740
U. S. Red. & Ref	38¾	35¼	38	1,300
U. S. Red. & Ref., Pf.	78	74½	77	2,000
U. S. Steel	35¾	32¾	34⅝	327,450
U. S. Steel, Pf.	102½	98¾	101½	136,635
Va. Car. Chem	36	31	35⅜	6,000

* Ex. div.

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Atlanta .18½—.17½; Bamb. Dalamar, 7; Comstock, .17—.16; Gugg. Exp., 28½; St'd Oil, 598—591½. (Boston) Ahmeek, 78—75; Ariz. Com, 39—34½; Black Mt., 8⅜—7½; East Butte, 9—8½; Keweenaw, 9½; Superior & Pitts., 16½—16; Majestic, 1¼—1; Raven, .99—.60; Shawmut, 1—⅞; Superior Cop. 13—12½; Troy, 2—1½.

BOSTON.

Adventure	6½	5⅝	6	535
Allouez	36⅛	31⅜	32¾	4,431
Atlantic	13⅜	12¾	13	370
Bingham	30	27½	29¾	2,115
Boston Consolidated	26¾	25	25½	4,790
Calumet & Arizona	110	109	109	645
Calumet & Hecla	685	680	682	62
Centennial	21	20	20	654
*Copper Range	71⅜	68¾	69½	4,686
Daly-West	16⅛	15	15½	414
Franklin	17¾	16¾	17¼	800
Granby	11⅜	10⅜	10¾	690
Greene Consolidated	24⅛	20	20¼	35,139
Isle Royal	17½	17	17½	535
Mass	7¾	7	7	134
Michigan	11¾	10¾	11¼	1,000
*Mohawk	62	60	60	399
Mont. Coal & Coke rcts.	2½	2¼	2¼	530
Nevada	18⅛	17	17⅝	3,010
*North Butte	86	83	85½	6,570
Old Dominion	38	36½	36½	885
Osceola	108½	101½	101⅝	1.420
Parrot	26	24	25⅞	685
Quincy	93	88¼	88½	459
Rhode Island	4¼	3¾	3¾	685
Shannon	9½	8	9½	16,555
Tamarack	95	93	94	167
Tecumseh	10½	10	10	495
Trinity	8¾	8	8	2,826
United Copper, com.	66¾	61¼	65	6,355
U. S. Oil	10	9¾	10	480
U. S. Smg. & Ref.	56	54	55½	1,017
*U. S. Smg. & Ref., pfd	45	44½	44⅞	1,822
Utah Copper	55¾	54	54⅞	4,237
*Victoria	7¼	6½	7	130
Winona	4¾	4	4¾	835
Wolverine	140	138	140	31

PHILADELPHIA. July 10.

Name of Company.	High	Low	Clg.	Sales.
American Cement	7½	7⅛	7½	150
Cambria Steel	34¾	34	34¾	2,464
General Asphalt	8½	8⅛	8⅛	55
Penn. Steel, pd	106	106	106	40
Philadelphia Co*	49½	49¾	49¾	263
Tonopah Mining*	19¾	18¾	19½	929

PITTSBURG. July 10.

Crucible Steel	11	9⅛	11	4,798
Crucible Steel, Pf.	76	74	75½	1 222
Harbison-Walker Ref.	10½	10½	10½	130
Ohio Tonopah	.30	.27	.27	9,155
Tonopah Ext	7⅛	4⅞	6⅞	28,430

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.023	66.108	28.047	30.464
March	58.046	64.597	26.794	29.854
April	56.600	64.765	26.108	29.984
May	57.832	66.976	26.664	30.968
June	58.428	65.394	26.910	30.185
July	58.915	.....	27.163	.....
August	60.259	..	27.822	.....
September	61.695	.....	28.528	.....
October	62.034	.....	28.637	.....
November	63.849	.....	29.493	.....
December	64.850		29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.310	15.128	18.416	68.262	78.896
Feb.	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18.688	67.017	84.793
May	14.627	18.457	14.820	18.724	64.875	84.867
June	14.673	18.442	14.813	18.719	65.881	83.994
July	14.888	.....	15.005	.....	66.887	.....
Aug.	15.664	.....	15.725	.....	69.830	.....
Sept.	15.965	.....	15.978	.....	69.667	.....
Oct.	16.279	.....	16.332	.....	71.406	.....
Nov.	16.599	.....	16.758		74.727	.....
Dec.	18.328	.....	18.398	.....	78.993	.....
Year.	15.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	29.325	36.390	July	31.760	.....
Feb.	29.262	36.403	August	32.866	.....
March	29.523	36.662	Sept	32.095	.....
April	30.525	38.900	Oct	32.481	.....
May	30.049	43.313	Nov	33.443	.....
June	30.329	39.260	Dec	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	4.552	5.600	July	4.524	.....
Feb.	4.450	5.464	Aug.	4.665	.....
March	4 470	5.350	Sept.	4.850	.....
April	4.500	5.404	Oct.	4.850	.....
May	4.500	5.685	Nov.	5.200	.....
June	4.500	5.750	Dec.	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 16.031; March, £ 15.922; April, £ 15.859; May, £ 16.725; June, £16.813.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	6.190	6.487	6.032	6.337	25.062	28.225
Feb.	6.139	6.075	5.989	5.924	24.594	25.844
Mar.	6.067	6.209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.434	5.997	5.284	5.846	23.594	27.000
June	5.190	6.096	5.040	5.948	23.875	27.406
July	5.396	.....	5.247	.....	23.938	.....
Aug.	5.706	.....	5.556	.....	24.675	.....
Sept.	5.887	.....	5.737	.....	26.375	.....
Oct.	6.087	.....	5.934	.....	28.225	.....
Nov.	6.145	.....	5.984	.....	28.500	.....
Dec.	6.522	.....	6.374	.....	28.719	.....
Year.	5.882	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.